SERVICE TRAINING COURSE

BOOK NUMBER 4

MONROE

"400" SERIES Models

*Function

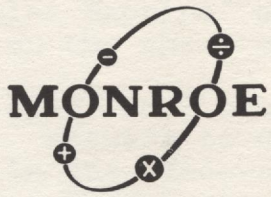
*Adjustment

*Nomenclature

GENERAL SERVICE DEPARTMENT
MONROE CALCULATING MACHINE CO., INC

SERVICE TRAINING COURSE

Book No. 4



ELEVEN SECTIONS

- GRAPHICAL INDEX OF MACHINE
- WHAT IS AN ADDING MACHINE
- IDENTIFYING FEATURES OF MODELS
- FULL-KEYBOARD ADDING MACHINE
- BASIC PRINCIPLE OF THE ADDING MACHINE
- MODEL DECODING
- INTRODUCTION TO INDIVIDUAL PARTS
- PART NUMBER CODING
- EXTENDED TRAINING AID
- QUESTIONNAIRE
- DETAILS OF ADJUSTMENT

COMPILED & PUBLISHED BY THE GRAPHIC ENGINEERING UNIT OF THE GENERAL SERVICE DEPARTMENT
MONROE CALCULATING MACHINE CO., INC.

FOREWORD

Book #4 of the service training course introduces the service trainee to the second category of Monroe products:- The Adding Machine. The term "Adding Machine" as used in this book signifies machines which furnish a printed listing on a roll or sheet of paper of amounts set into the keyboard. The "Adding Machine" also prints the totals of the figures listed on the sheet or roll.

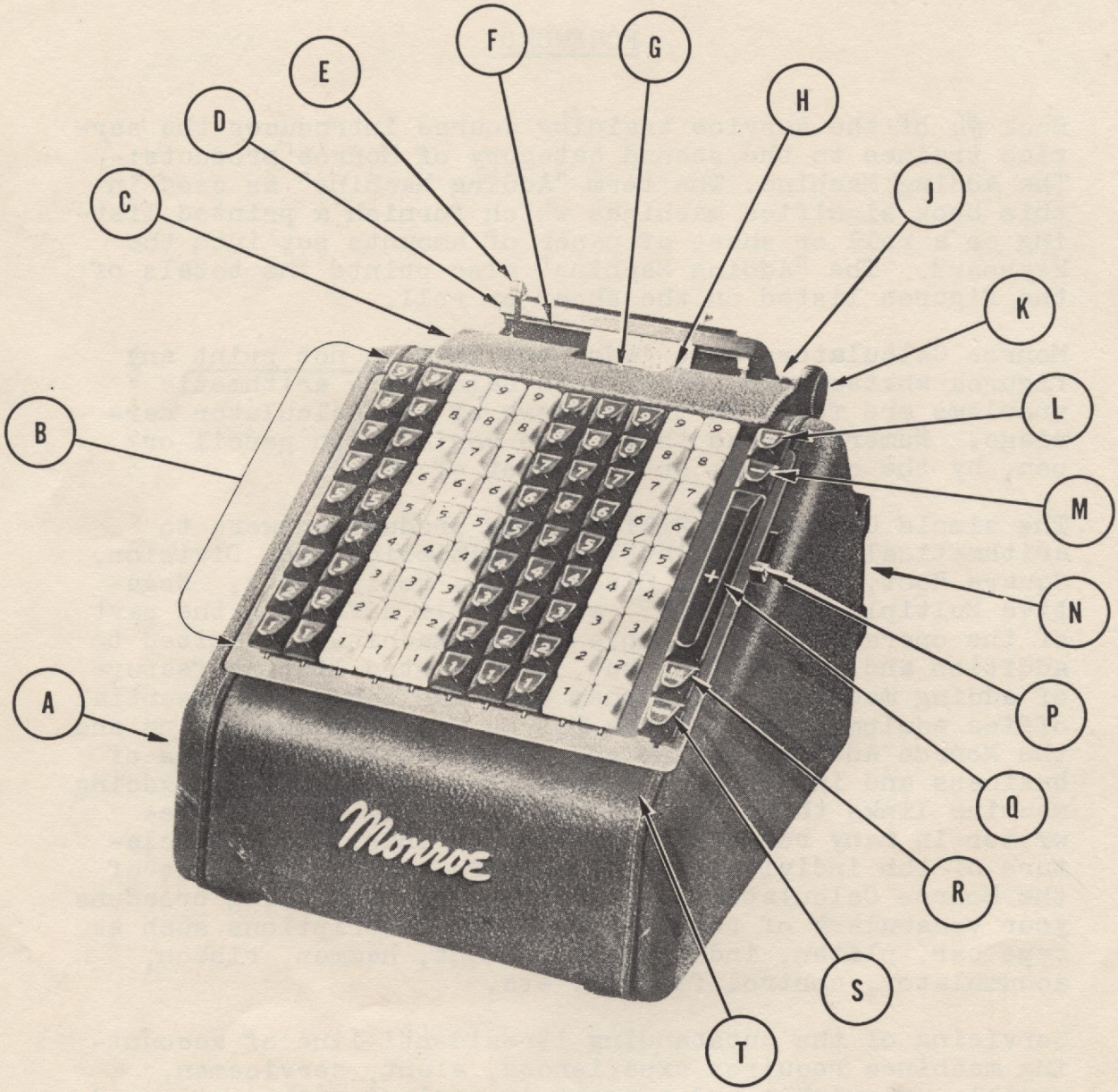
Monroe Calculators also 'add' but they do not print any figures whatsoever; answers to Calculator arithmetic problems are found in the windows of the calculator carriage. Numerals read there, are copied with pencil or pen, by the operator, onto a sheet of paper.

The simple Calculator will quickly produce answers to arithmetical problems involving Multiplication, Division, Square Root, Prorating, Discounting, Reciprocals, Negative Multiplication, etc. with little effort on the part of the operator. The simple adding machine is limited to addition and subtraction but, the printed listing feature of adding machines makes them very desirable and essential office equipment. Both the Monroe Calculating Machine and the Monroe Adding Machine are vital to all categories of business and industry. The printing feature of the adding machine links these machines structurally to the typewriter in many respects. Because of this, the nomenclature of the individual parts differs widely from that of the Monroe Calculators. Adding machine servicing broadens your vocabulary of repair terms with descriptions such as type bar, platen, index blade, detent, hammer, ribbon, accumulator, control flipper, etc.

Servicing of the outstanding 'President' line of accounting machines requires experienced, alert, servicemen, capable of quickly and accurately analyzing the cause and source of malfunctions.

A thorough understanding of adding machines is absolutely necessary before a serviceman is permitted to attempt servicing the more complicated models.

410-11-011 MODEL · GRAPHICAL INDEX



A GENERAL MECHANISM
B NUMERAL KEYS
C RIBBON COVER
D PAPER KNIFE
E PAPER RELEASE LEVER
F PLATEN
G TYPE BARS
H RIBBON MECHANISM
J CARRIAGE
K PLATEN KNOB
L NON-ADD KEY
M MINUS KEY
N MOTOR
P CORRECTION LEVER
Q PLUS KEY
R SUB-TOTAL KEY
S TOTAL KEY
T OPERATING SLIDES

WHAT IS AN ADDING MACHINE ?

The first impression often obtained of an adding machine is that of a special typewriter that prints only numerals and certain symbols. This comparison has a sound basis because the majority of parts used in the Monroe Adding (Listing) Machine 410-11-011 are employed for the purpose of printing numerals on paper. The common typewriter keyboard contains numerals, in comparison-so does the adding machine, the electric typewriter spaces the paper upward at completion of a line of print, the adding machine does likewise. The typewriter uses a hard rubber roller to support the paper and cushion the blow of the type bar; it is known as a platen. The adding machine uses a platen also. The type bars of the typewriter raise and lower, as do the type bars of the adding machine.

The differences in accomplishing the printing on our adding machine, as compared to the typewriter, are as follows. Each key letter and number on the typewriter has its own type bar, whereas, the fully keyboard adding machine has only one type bar per keyboard column (bank). The typewriter prints immediately as each letter key is depressed, the adding machine type bars fire collectively (at one time).

The point where the two differ most widely lies in the fact that the adding machine must accumulate figures. To do this, part of the mechanism used for printing is also used to actuate a set of wheels known as 'registers' or 'accumulators' which in turn serve as a control to set the type bars to print the sums, results, or products, of the amounts set by depressing keys in the keyboard.

Other mechanism of the adding machine is required to control the ADD, NON-ADD, SUBTRACT, TOTAL, SUB-TOTAL, AND NEGATIVE TOTAL FUNCTIONS.

For a machine to add, a set of gears, 'registers' or 'accumulators' must be incorporated in the mechanism to store and eventually set, the type bars for a total. The Monroe accumulators receive their 'off neutral' displacement from parts known as 'rack arms'. The 'crawl carry-over' function of Monroe accumulators operate similarly to that used in speedometers and item counters on factory equipment. The 'crawl' can also be seen in taxi fare meters, etc., where a "1" will appear in an adjoining dial when the nine in the first dial is moved to "0" zero position. The subsequent locking of the accumulator gear in a fixed position, upon the taking of a total, limits the movement of the rack arm and the raising of the type bar. A glance through the parts catalog of the "400" series adding machine will show much mechanism other than that referred to in the foregoing. We purposely do not refer to it at this time because it serves supplemental purposes, and avoiding reference to it will simplify your grasping the basic fundamentals.

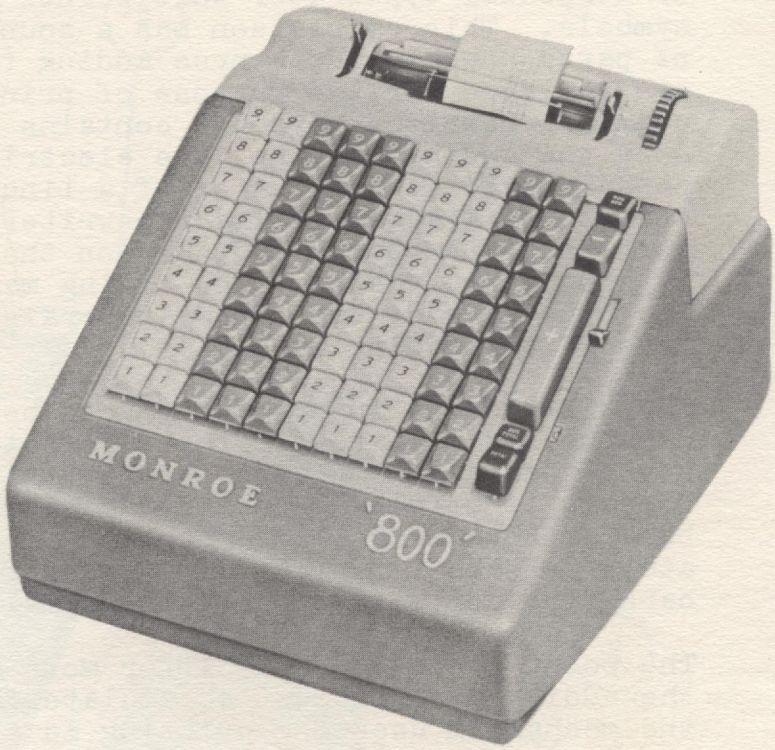
011A10

10 COLUMN KEYBOARD

NARROW CARRIAGE

SUBTRACT ITEMS & NEGATIVE

TOTALS PRINTED IN RED



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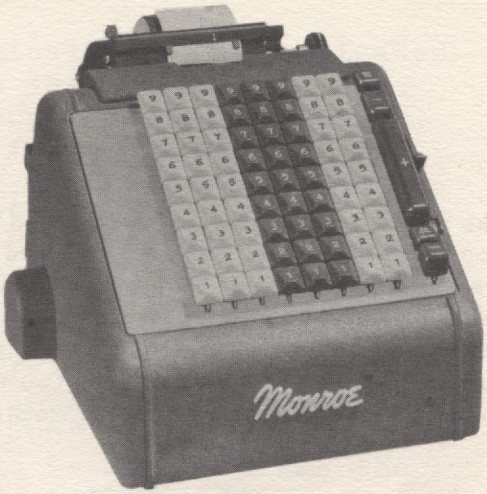
10 COLUMN KEYBOARD

WIDE MOVABLE CARRIAGE

SUBTRACT ITEMS & NEGATIVE

TOTALS PRINTED IN RED

408-11-001



ELECTRICALLY OPERATED

8 COLUMN KEYBOARD

NARROW STATIONARY CARRIAGE

408-22-001

ELECTRICALLY OPERATED

8 COLUMN KEYBOARD

WIDE MOVABLE CARRIAGE

410-28-092

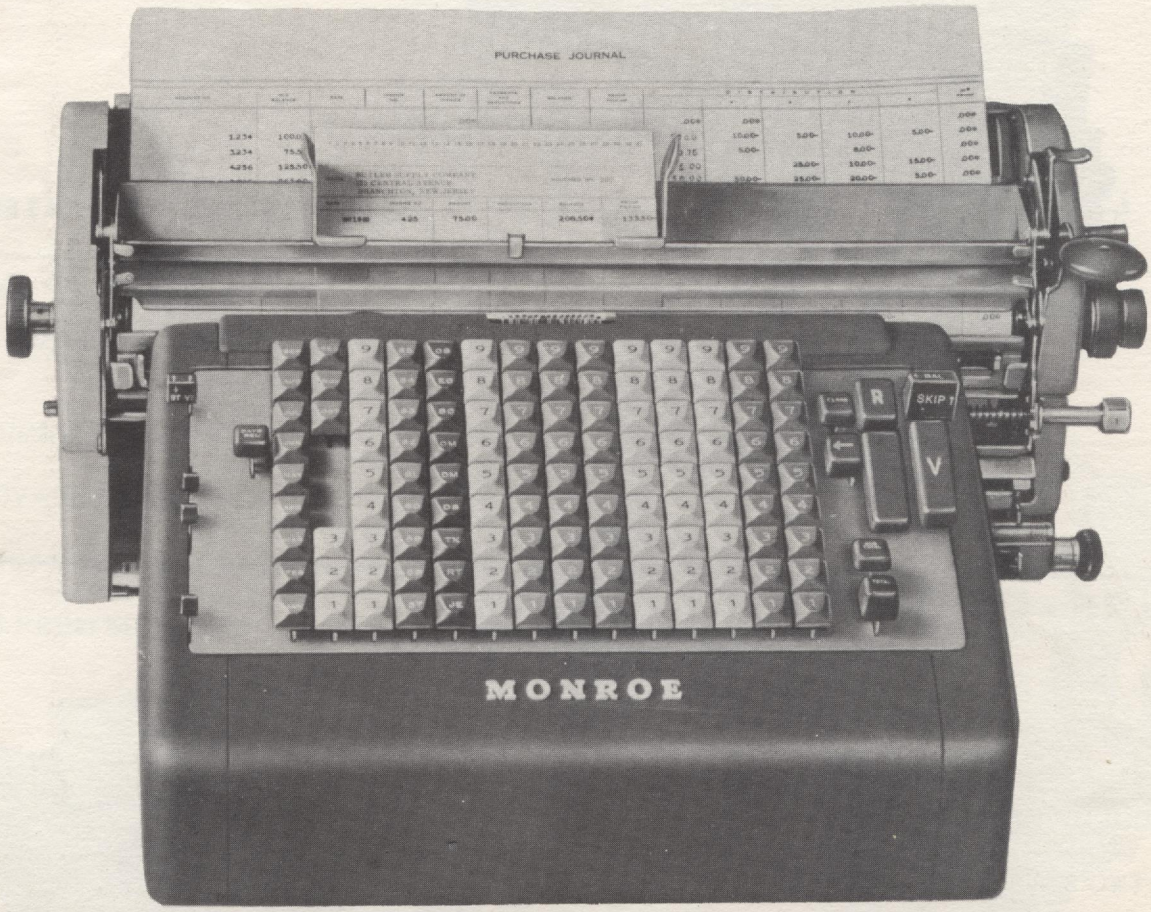
10 COLUMN KEYBOARD

HAS TWO SETS OF REGISTERS

WIDE MOVABLE CARRIAGE

MONROE *President* ACCOUNTING MACHINE

The machine shown below is identified as the "B" series (President) accounting machine. You as a trainee will not be expected to service this line until you have mastered the complete series of adding machines outlined in this book. It is shown herein merely to illustrate the evolution and progress of the Monroe adding machine line. A complete function and adjustment manual is being prepared which will cover the mechanism of this outstanding accounting machine. You will be furnished with this manual when you begin studies on the (President) "B" series machines.



FULL KEYBOARD ADDING MACHINE

The Monroe Adding Machine is mechanically less complicated, than the Monroe Calculator. It has less parts and its mechanism cycles at 145 R.P.M. in contrast to the faster 650 R.P.M. of the calculator. The full keyboard adding machine, like the calculator, has a basic design that conveniently lends itself to incorporation of desirable sales features. The first Monroe Adding Machines marketed were the "100" series hand machines which were followed by the popular "200" series electric adding and accounting machines of many models. The "400" series adding machine is electric but its exterior design differs from the "200" series machines. Its mechanism is considerably different also. The "300" series is of the "400" series design, but is hand operated. The next model to be marketed was the "800" series (now identified as "A" series). It is externally different from the "400" but is electrically operated and its interior is similar to the "400" series.

The full keyboard line of machines includes the "B" series (President) accounting models which are (mechanically) the most complicated of our entire line of adding-accounting machines.

Reference herein to the words "FULL KEYBOARD" is intended to identify adding machines with nine to fourteen columns (rows)(banks) of numeral keytops. Contrasted with this is the ten key ("600" "V" and "H" series) adding machines.

DEVELOPMENT OF FULL-KEYBOARD ADDING MACHINES

100 Series (Hand Operated)

200 Series Elec. Nar. Carr. - 200 Series Acctng. Wide Carr. - 200 Series Feat.

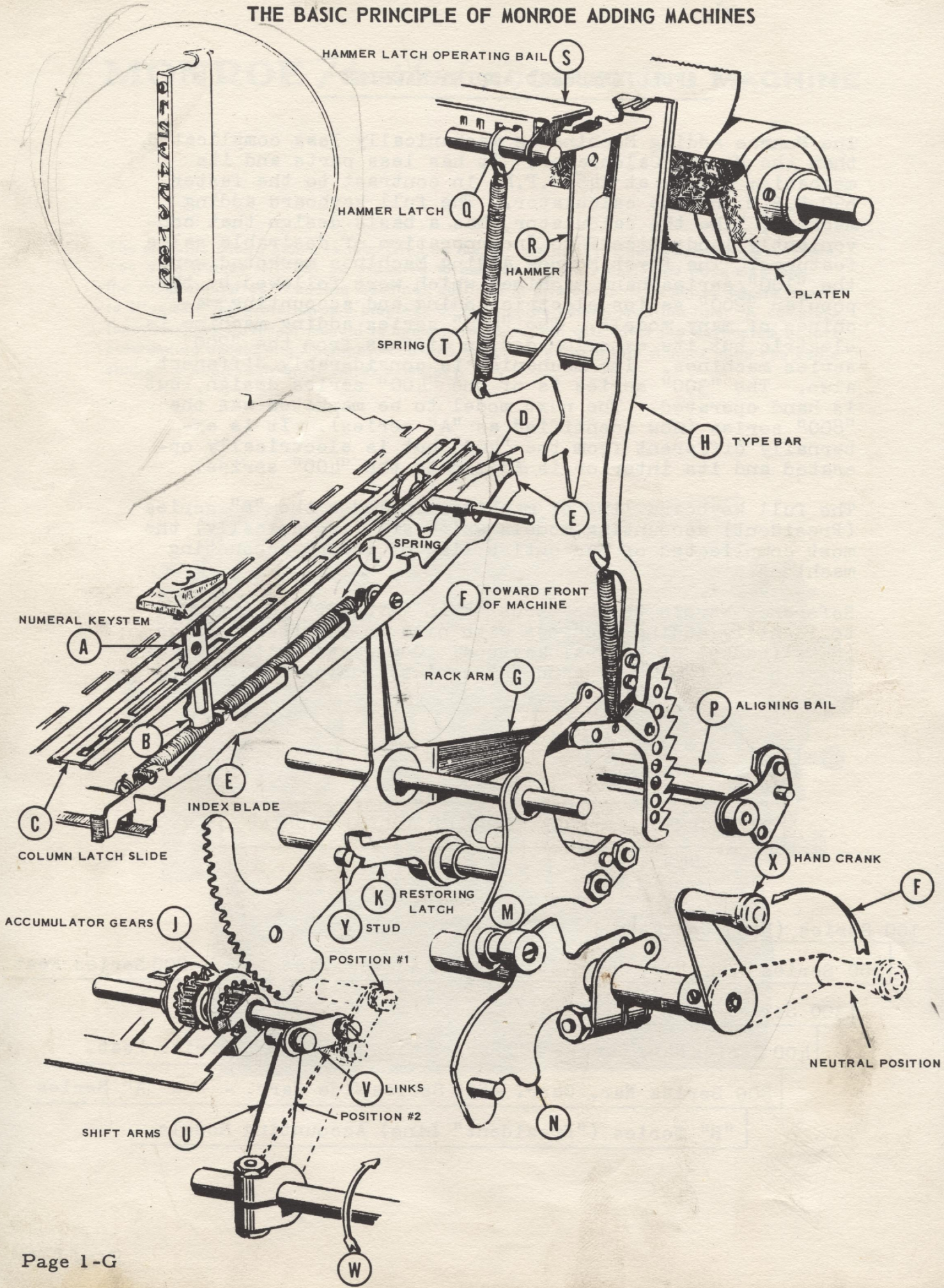
300 Series (Hand Operated)

400 Series Nar. Carr. - 400 Series Wide Carr. - 400 Series Feat.

800 Series Nar. Carr. - 800 Series Wide Carr. - Now "A" Series

"B" Series ("President" Line) Accounting Models

THE BASIC PRINCIPLE OF MONROE ADDING MACHINES



THE BASIC PRINCIPLE OF MONROE ADDING MACHINES

Mechanical arithmetic is manually accomplished within Monroe Adding Machines through the initial rocking of a lever by the turning of a crank while one or more numeral keystems are depressed in the keyboard.

The depression of a numeral keystem (A) causes its camming surface (B) to move a column latch slide (C) toward the front of the machine. Slide (C) pivots the column latch (D) out of the path of index blade (E). The purpose of (D) is to hold (E) in restored (neutral) position when all numeral keys are upward in their neutral position.

The action resulting from the movement of the crank or lever in the direction of arrow (F) is referred to as the forward stroke of a plus operation. An offset on index blade (E) then limits against the depressed numeral keystem as shown, positioning the type bar upward for printing. The accumulator gears (J) through shift arms (U) and links (V) will be driven to #2 position in illustration during this movement (out of engagement with the rack arms teeth (G).

Accumulator gears (J) store the amount set in the keyboard and print it on the tape by being rotated by the teeth of the rack arm (G). The sum of two or more numerals are set in the accumulator gears by the teeth of rack arm (G) (as it restores to its neutral position following a printing). Use of the total key, through the medium of a total hook (not shown) will cause the accumulators to limit, thereby preventing them from turning beyond the sum stored therein. As a result of this, the disengagement of latch (K) from rack arm (G) will permit (G) to pivot and its forward end to move downward under tension of spring (L) until stopped by the storage gears. At this time the type bar numeral, representing the sum previously stored in the accumulators will have been raised to a printing position.

The main restoring arm (M) and its roller, rides downward as the main restoring cam (N) rotates toward the front of the machine. The rack arm restoring latch (K) will later, on the return stroke, cause the rack arm (G), type bar (H) and index blade (E) to become active.

At this point the aligning bail (P) is driven into engagement with the rear steps of the rack arm (G) to set the type bar for uniform alignment.

Also, at the beginning of the forward motion of (N), the active type bar (H) permits the hammer latch (Q) to engage with the lug on the top of hammer (R). When the machine has completed its forward cycle, the hammer latch operating bail (S), through mechanism not shown, drives the hammer latch (Q) downward thereby allowing the hammer, through tension of spring (T), to drive the type bar (H) against the ribbon. This presses the paper against the platen and an ink imprint is made.

At the beginning of the return plus stroke (toward the rear of the machine) the accumulator shift arms (U) and links (V) move in the direction of arrow (W) and drive the accumulator gears (J) into engagement with the rack arm (G).

As the main restoring arm (M) is driven to its restored (neutral) position by the main restoring cam (N), the rack arm restoring latch (K) engages with stud (Y) on the rack arm (G). Arm (G), in turn, rotates the accumulator gear (J) the number of teeth corresponding to the amount printed.

During a subtract operation, the procedure previously outlined is repeated with the exception of the shifting of the accumulator gears, which during subtraction are in mesh with the rack arm on its downward movement.

"All of man's knowledge has at one time or another been put between the covers of books. If a man can read and really desires to master any subject, he can educate himself". (Changing Times)

DECODING OF MODEL DESIGNATION

STEP 1 WRITE MODEL HERE

STEP 2 REFER TO CHART

STEP 3 ENTER DATA HERE

BLOCK I	BLOCK II	BLOCK III	BLOCK IV	BLOCK V	BLOCK VI	BLOCK VII
0	**3**	**2**	**A**	**1**	**3**	**9**
KEYBOARD PRINTING CAPACITY	*STYLE & WIDTH OF CARRIAGE*	*ACTION OF CARRIAGE*	*SERIES*	*AMOUNT OF REGISTERS*	*SPECIAL DESIGNATION*	*ELECTRO-MECHANICAL OR MECHANICAL*
TEN COLUMNS	REAR FEED 13"	MANUAL TABULATING	FULL KEYBOARD 800 STYLE	ONE SET OF ACCUMULATORS	NO CREDIT BALANCE	

= TRANSLATION

FULL KEYBOARD '800' STYLE WITH TEN COLUMNS OF KEYTOPS, A MANUAL TABULATING 13" REAR FEED CARRIAGE, HAS ONE REGISTER, NO CREDIT BALANCE.

BLOCK I = Indicator of columns (8 to 14) [0] = 10 [1] = 11 [2] = 12 [3] = 13 [4] = 14

II = Indicator of carriage width (1 to 7) [1] = 4½" [2] = 13" FF [3] = 13" RF [4] = 15¾" FF [5] = 15¾" RF [6] = 18½" FF [7] = 18½" RF (FF = Front Feed, RF = Rear Feed)

III = Indicator of carriage action [1] = Stationary [2] = Manual Tabulating [3] = Shuttle

IV = Indicator of series [A] = 800 Full Keyboard [V] = Ten-Key Electric [H] = Ten-Key Hand

V = Indicator of registers [1] = One set of Accumulators [2] = Two sets of Accumulators

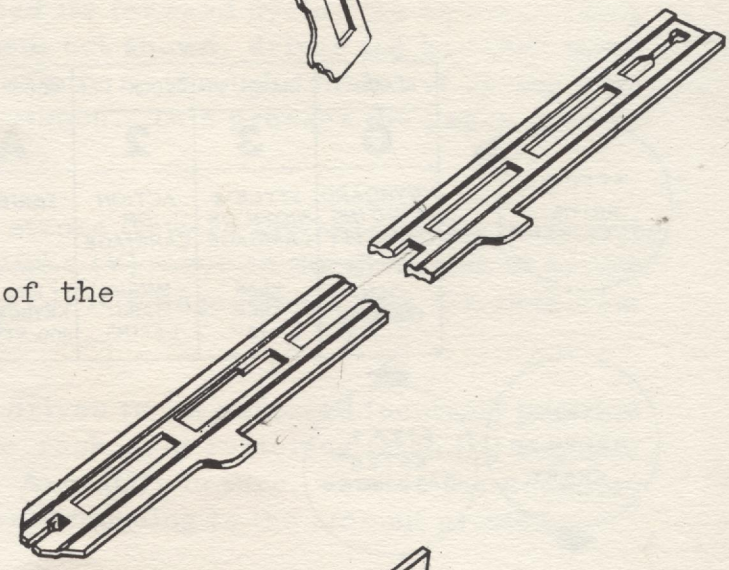
VI = Indicator of special designation [0] = Standard [1] = Extra Total Capacity with Cr. Bal. [2] = Hand Electric [3] = No Credit Balance [4] = Hand [5] = Extra Total Capacity without Credit Balance

VII = Indicator of device

MONROE

NUMERAL KEYSTEM

When depressed the camming surfaces of this keystem contact and move a

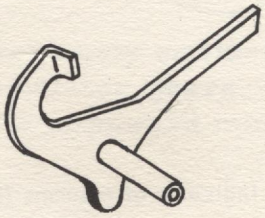


COLUMN LATCH SLIDE

This slide moves toward the front of the machine and in doing so, moves the

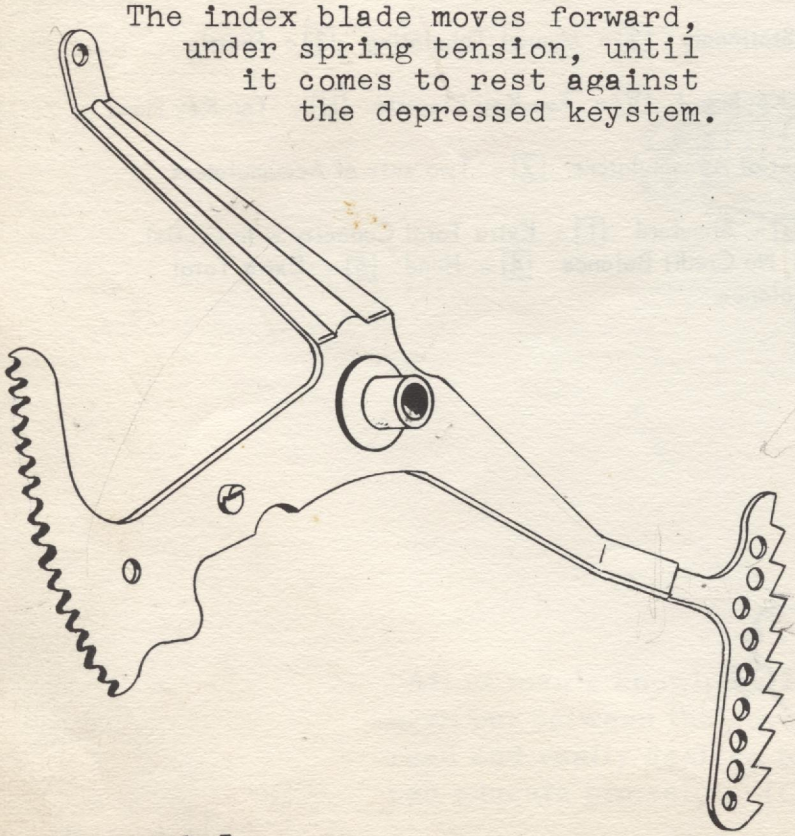
COLUMN LATCH

This latch pivots upward out of the path of the



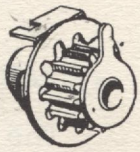
INDEX BLADE

The index blade moves forward, under spring tension, until it comes to rest against the depressed keystem.



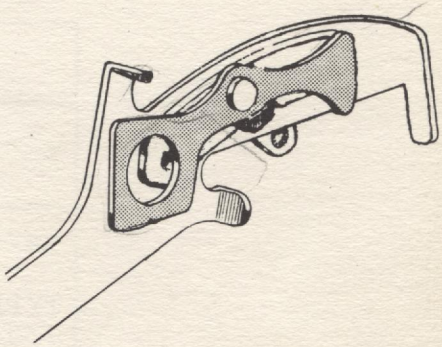
RACK ARM.

The rack arm, being attached to the index blade, moves downward, revolving the accumulator gear.



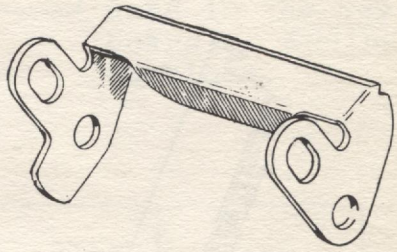
ACCUMULATOR GEAR

The timing and direction of the motion of the accumulator gears is controlled by the



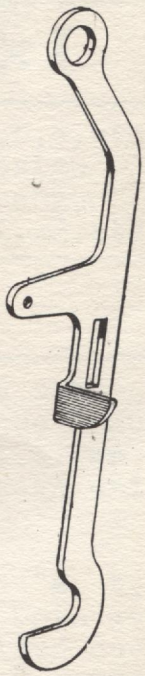
CONTROL FLIPPER.

This in turn is controlled by the operating keys.



ALIGNING BAIL

This bail enters the rear steps of the rack arm thereby aligning the type bars for uniform printing horizontally.

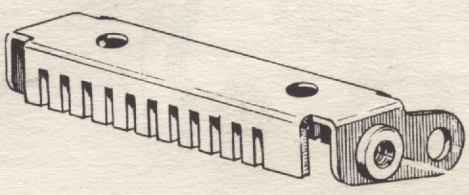


LATCH OPERATING CONTROL BAIL ARM

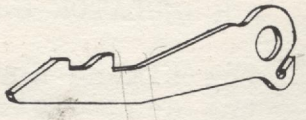
This arm is moved downward, actuating the

LATCH OPERATING BAIL.

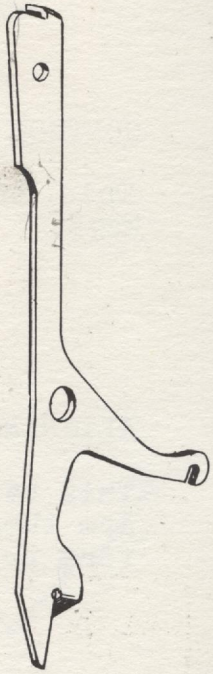
This bail contacts the hammer latches.



HAMMER LATCHES

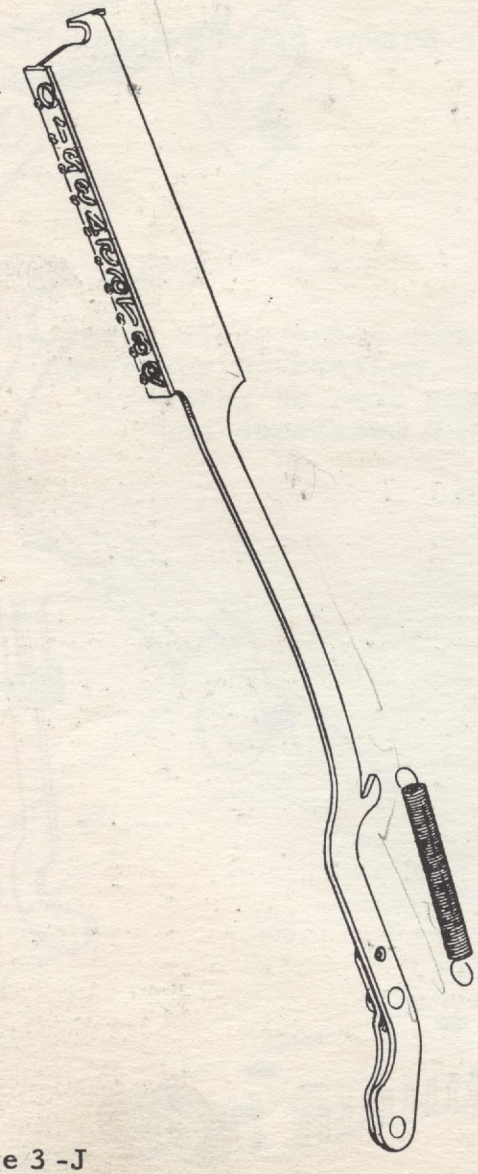


The downward movement of the hammer latches release the



TYPE HAMMER.

This being under spring tension, moves rearward and strikes the



TYPE BAR.

The type bar is driven against the ribbon causing an imprinting on the paper roll.

PART NUMBER CODING

The manner in which Adding machine part numbers are deciphered is illustrated below:

SINGLE (One-Piece) PART

Block I	Block II	Block III	Block IV	Block V
L	**2**	**8**	**9**	**a**
Model	Section	Part	Number Sequence	a,b,c,etc. Design Change x1,x2,etc.
Adding	Keyboard	Spring		

=L289 is a Spring used in the keyboard of Adding Machines.

ASSEMBLY PART

Block I	Block II	Block III	Block IV	Block V	Block VI	Block VII	Block VIII	Block IX
L	**4**	**-**	**4**	**1**	**0**	**3**	**5**	**x1**
Model	Section	Assem.	Kind of Assem.	Blanks	Number Release Sequence			a,b,c,etc. Design Change x1,x2,etc.
Adding	Accumulator		Sub-Assem.	Stamped Gears				

L4-41035 is a sub-assembly of the accumulator shaft i.e. an accumulator gear unit.

Some parts and assemblies contain (in Block IX) lower case letters "a, b, c," etc. or a small "x" followed by a numeral. In some instances both are found in a part number. The small letters indicate a part of revised design that is interchangable with the previous style part. The "x" symbol indicates that the part has been revised in such a manner that it is not interchangable with the previous style part. The numeral following the "x" designates the sequence of such revisions.

PART NUMBER CODING

The digits and cyphers used in Adding Machine part numbers are meaningful and can be of value to servicemen in identifying parts. With listers, as well as calculators, the part numbers in which a dash (-) appears are known as "assemblies". The dash indicates that two or more parts have been joined to form an assembly during manufacture at the factory.

Block I	Block II		Block III
Model	Section of Machine	Code	Manufacture Category
Adding "L"	Electric	1	1-99 Pins, Washers, Rings
	Keyboard	2	X00-X099 Shafts
	Frame	3	X10-X299 Blanks
	Accumulator	4	X30-X499 Hubs, Rolls Collars, Washers
	Ribbon	5	X50-X699 Studs, Rivets
	Total & Index	6	X70-X799 Nuts, Screws
	Hammer	7	X80-X899 Springs
	Narrow Carriage	8	X90-X999 Commercial & Molded Parts
	Wide Carriage with Back Plates	9	
			X=Section Number Space

Part numbers without a dash, such as L91058, are single items made of one piece of steel or plastic, etc.

EXTENDED TRAINING AID

The mechanism of the 300, 400, and 800 adding machines is illustrated and described in detail in the following service literature which should be available in your Branch Library for further study.

"400" Series

MACHINE SERVICE BULLETIN NO. 150Q#2, 450, 450-A, 450-B, 450-C, 450-D, 450-E, 450-F, 450-G, 450-H, 464, 468, 471, 472, 488, 492, 497, 498. Catalog M.S.B. #451.

LISTER SERVICE BULLETIN NO. 4-501, 4-502, 4-508, 4-504, 4-505, 4-506, 4-507, 4-508, 4-509, 4-510, 4-511, 4-512, 4-513, 4-514, 4-516, 4-517, 4-518, 4-519, 4-520.

"800" Series

LISTER SERVICE BULLETIN NO. 8-500-A, 8-500-B, 8-501, 8-502, 8-503, 8-504.

"300" Series

LISTER SERVICE BULLETIN NO. 3-501, 3-502.

"200" Series

The "200" Series Adding and Accounting Machines are covered in the following machine service bulletins:

Machine Service Bulletin NO. 150, 150-N, 150-T, 150-U, 152, 162-B, 162-C, 173-A, 246, 248, 359, 362, 363, 384, Lister Service Bulletin #2-501, #2-507, and many others. Ask your instructor to show you M.S.B. #444 and 444-A Volumes #1 and #2, prepared for schooling purposes.

The true university of these days is a collection of books.

CARLYLE

SECTION (M) QUESTIONNAIRE

'400' Series Adding Machine

STUDENT _____ BRANCH _____ DATE _____

DIVISION EXAMINER _____ RIGHT _____ WRONG _____

1 **Q.** What is the one outstanding characteristic or visible feature of the Monroe Adding Machine that distinguishes it from the Monroe Calculator i.e. what will it do that the calculator cannot do?

A.

2 **Q.** What other popular office machine is the adding machine similar to in one major respect. Why?

A.

3 **Q.** What is "crawl carryover"? What common devices employ this mechanical means?

A.

4 **Q.** What important gear permits a machine to add?

A.

5 **Q.** Although this Book #4 is primarily a "400" series adding machine training book it refers to other Monroe adding and accounting machine series to give you a background. What are the other series?

A.

6 **Q.** How does the adding machine differ from the calculator mechanically in parts and revolutions per minute ?

A.

QUESTIONNAIRE

7 Q. What part holds the rack arm and index blade rearward when in neutral position?

A.

8 Q. What part actuates the column latch?

A.

9 Q. Do the rack arm teeth turn the accumulator gears on each of the rack arms downward movements?

A.

10 Q. Do the rack arm teeth turn the accumulator gears on each of the rack arms upward return movements?

A.

11 Q. What is the total number of gear teeth in an accumulator gear?

A.

12 Q. What purpose does the offset lug (ledge) on the accumulator serve?

A.

13 Q. How is the rack arm restored upward?

A.

14 Q. How are the type bar numerals aligned prior to printing?

A.

15 Q. Are the hammers latched (toward front of machine) when a machine is in neutral?

A.

16 Q. What is a 408-22-001 machine? Dicipher the numerals.

A.

17 Q. What causes the accumulator gears to be active or inactive during the forward and return cycles of the machine?

A.

18 Q. The movement and function of the numeral printing mechanism are exactly the same during an ADD, NON-ADD or SUBTRACT operation. Is this statement true or false?

A.

19 Q. The only difference between a sub-total operation and a total operation is that the accumulator gears must remain in engagement with teeth of the rack arms during the forward and return machine cycle on the sub-total operation. The character type bar must also be positioned to print the sub-total symbol. Is this right or wrong?

A.

20 Q. When the machine performs a negative sub-total operation, it makes four complete cycles. Right or wrong?

A.

21 Q. How many type bars are there in a standard 408 machine? A 410 model?

A.

22 Q. Are all "400" series carriages moveable sideways by hand, during machine use?

A.

23 Q. How does a "300" series machine differ from a "400" series?

A.

24 Q. Is there a speed variance between "800" series and "400" series machines?

A.

25 Q. What is the external identifying features that distinguish one from the other? "800" series and "400" series.

A.

26 Q. Large foldout illustrations are furnished in the rear of this book. Study them. How do they help you obtain a good understanding of the workings of the various mechanisms?

A.

410-11-011 MODEL FUNCTION AND ADJUSTING SEQUENCE

INDEX BY SECTIONS

MACHINE CYCLES

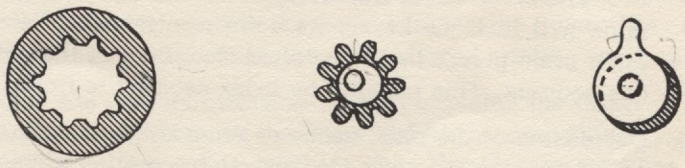
Accumulator position: In or out of mesh with the rack arms' teeth during the various functions.

Neutral – Accumulators are always in mesh.
Plus – Accumulators are in mesh on the return stroke.
Minus – Accumulators are in mesh on the forward stroke.
Non-Add – Accumulators are in mesh on both strokes.
Total – Accumulators are in mesh on the forward stroke.
Sub-Total – Accumulators are in mesh on both strokes.

OVERDRAFT FUNCTIONS

CR = Three cycles: #1=Total, #2=Subtract, #3=Total.
CR = Four cycles: #1, #2, #3 cycles same as CR, #4 cycle=subtract. During negative total and sub-total functions the accumulators are always in mesh on all forward strokes.

MECHANICAL ACTION OF THE ACCUMULATOR GEARS



TEN TEETH NINE TEETH

The eccentric of the number one accumulator gear is always locked in a stationary position. The eccentrics in all other accumulator gears are free to rotate with the accumulator gears.

Notice that the gears driven by the rack arms have nine teeth, but the floating accumulator gears have ten teeth.

Start with the accumulator gears cleared to zero. If a nine is added in the first column the nine toothed gear will rotate one complete revolution. The teeth on the nine toothed gear which is farthest from the eccentric will activate the ten toothed floating gear in the adjacent column to the left and will position that zero stop 9/10 of one tooth away from its zero position. If a one is now added to that same column which received the nine the gear in the adjacent column will have been active through all ten teeth of the internal rim gear. This resulted in a 9/10 + 1/10 tooth displacement, or one complete tooth, due to the gear ratio of nine to ten. I.E. a carry-over of one from any column to the adjacent column on the left is accomplished in this manner.

SAMPLE PROBLEMS

			0*					0*	
0	8	3	7	5 +	0	2	0	4	6 +
8/10	3/10	7/10	5/10		2/10	0/10	4/10	6/10	
3/100	7/100	5/100			0/100	4/100	6/100		
7/1000	5/1000				4/1000	6/1000			
5/10,000					6/10,000				

The amount to be added is set on the keyboard. These amounts will be the number of teeth displaced on the nine toothed gears by the rack arms. The displacement of the zero stops from their neutral positions are the actual number of teeth displacements of the nine toothed gears plus the carry-over in tenths by the accumulator gears' eccentrics (This crawl carry-over is theoretically continuous into the last accumulator gear to the left).

For instance: Two dollars subtracted from either of these problems will change the crawl carry-over diagonal accordingly. Therefore, in working out problems it is important that the tenth fractional carry-overs are placed in the proper columns thereby eliminating errors in diagnosing accumulator troubles.

PRINTING FUNCTION

Refer to fold out Page 33-N.

In studying the printing we will completely disregard all other functions and activities of the machine and concentrate entirely on the mechanism used to produce a printed record on the paper of the amount set on the keyboard.

1. Depress a numeral key. The camming action of the keystem causes two slides to be operated. (a) The numeral key detent locking slide will lock the key in its down position. (b) The zero column latch slide pivots the zero column latch out of the path of the index segment. This permits the index segment to travel.

2. Depression of the plus, minus or non-add key causes the keyboard operating slide to pivot the keyboard operating slide latch out of the aperture of the main operating slide. This permits this slide through its spring tension to move forward, locking the operated keystem in its down position. All other operating keys are now blocked against depression by this slide.

3. As the main operating slide moves forward an offset on its left upper end releases the switch closing and clutch operating arm through its release latch. This causes the switch contact points to be closed and releases the clutch dog. An adjustable stud on the main operating slide locates the yoke for the numeral key detent interlock. Through a linkage, this positions the interlock into the path of the numeral key detent locking slides thereby preventing any numeral key depression during a machine cycling.

4. The machine starts its forward cycle. The main cam shaft and the upper rocker shaft start their forward stroke. The rack arm restoring latch assemblies' rollers, ride the camming surfaces of #2 and #3 main cams and through spring tension, the rack arm restoring latch assembly moves down and to the rear. This permits the rack arms to pivot, raising the typebars until the depressed numeral keystems block the movement of the index blades thus determining the number to be printed later. NOTE: The index blades, rack arms and typebars are moved during the forward stroke by spring tension.

5. Upper Rocker Shaft: Through a connecting link to the #4 main cam the upper rocker shaft starts on its first one half cycle. The cam on the left drives the ribbon feed mechanism.

   The second cam from the left releases the paper spacing pawl. (Paper spacing takes place during the return cycle).

   The rollers on the clamped arms drive the ribbon guides thus moving the ribbon away from the typebars, before the typebars move. Also, the linkage connected to the hammer triggers guide bracket, is released. This permits the guide bracket to raise and the hammer firing triggers move up, blocking the hammer offsets and preventing the hammers from firing until this firing action is called for. During this forward stroke the hammer restoring shaft, through linkage connected to the clamped arms, moves away from the lower ends of the hammers.

   Near the completion of the forward machine stroke (after the typebars have been permitted to travel their maximum distance) the roller on the right clamped arm operates a yoke which through an adjustable linkage moves the type aligning bar into engagement with the rear teeth of the rack arms and pulling the rack arms slightly downward. This prevents the offsets on the index blades from cramping against the keystems. At the same time, this bar locks the typebars in horizontally aligned printing position.

   When the forward stroke is nearly completed the offset of the left clamped arm contacts the lower end of the connecting link for the hammer trigger guide bracket. When the #1 main cam has still to travel 1/16" in its forward stroke the guide bracket moves the firing triggers away from the offsets on the hammers, permitting the hammers to fire against the typebars.

   NOTE: Zeros to the left of the numerals will not print because the offset on the typebars (being at zero position) prevented the hammer triggers from raising with the guide bracket. Therefore, the hammers move slowly rearward during the forward stroke.

   Zeros to the right of the numerals will print due to the offsets at the lower ends of the hammers preventing the hammers from moving until the adjacent number to the left fires. The zeros to the right will then fire simultaneously with the adjacent numeral to their left.

6. Return stroke or restoring stroke: The return stroke reverses the forward stroke
   a. The aligning bar is moved away from the rear teeth of the rack arms to permit them to travel.
   b. The hammer restoring shaft restores the hammers.
   c. The hammer trigger guide bail is returned.
   d. The paper spacing takes place during the return stroke.
   e. The ribbon may be advanced on either the forward or return stroke. During the return stroke the rollers on the rack arms' restoring latch assembly ride the camming surfaces of #2 and #3 main cams. The rack arms' restoring latches pick up the studs on the rack arms, driving the rack arms, index blades and typebars back to their normal, restored positions.

7. Near the completion of the return stroke, the cam on the clutch assembly operates the roller of the main operating control slide's restoring arm, picking up the operating slide through spring connections. As the main operating control slide is restored to normal:
   a. The adjustable stud on the main operating slide permits the numeral keys detent interlock to normalize and the keyboard is now unlocked.
   b. The operating key is released.
   c. The keyboard's operating slide trigger locates in the aperture of the main operating slide.
   d. The switch closing and clutch operating arm is restored and the release latch moves into blocking position. (The contact points are held closed until the machine cycling is completed, by the secondary switch closing insulator).
   e. Finally, with a slight overthrow of the main operating slide the permanent stud strikes the keyboard clearing bell crank. This, through the keyboard master clearing bail, clears the numerals from the keyboard thus permitting the zero column latch slides to go to the rear and the zero column latches are lowered into the path of the upward extension of the index blades.
   f. The restoring roller passes the peak on the clutch cam thereby permitting the main operating slide to move forward until blocked by the keyboard operating slide trigger.
   g. The offset on the clutch dog strikes the lower end of the switch closing and clutch operating arm. This pulls the nose of the clutch dog out of the castellation of the clutch drive gear, stopping the machine cycling.

MACHINE CONTROL OPERATING SLIDES

There are five control operating slides located under the main control operating slide in sequence from left to right, they are:

I. Quick Stroke Control Operating Slide
II. Index Blades' Control Operating Slide
III. Flipper Control Operating Slide
VI. Total Trip Control Operating Slide
V. Character Control Operating Slide

1. The purpose of the quick stroke operating slide is to prevent malfunctions from quick stroking any of the operating keys.

2. The function of the index blades' control operating slide is to permit the shifting of the index blades out of the path of the zero column latches and of the keystems during total, sub-total, credit balance and sub-total credit balance operations.

3. The function of the flipper control operating slide is to position the flipper into the correct position for all machine functions before any movement of the rack arms, index blades and typebars at the beginning of machine cycles.

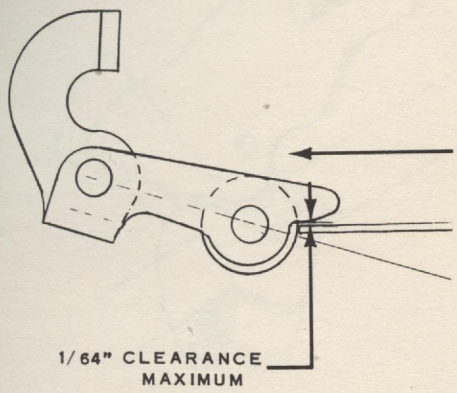
4. The function of the total trip control operating slide is to start the tripping of any total or sub-total.

5. The function of the character control operating slide is to control the character type bar so that it will be held in the correct printing position to correspond with the machine function.

ADJUSTMENTS OF THE CONTROL OPERATING SLIDES WITH THE MACHINE IN NEUTRAL:

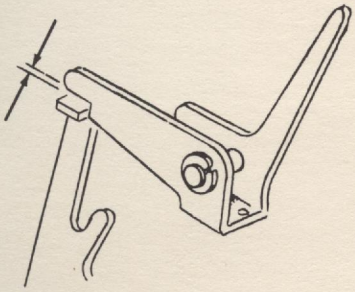
Main operating slide: Adjust the keyboard operating slide trigger, by forming, to permit the roller to locate in the aperture as shown in sketch.

NOTE: The latch extension should have only (1/64") clearance above the main operating slide. (Having the high point of the roller below the slide will hold the latch down).

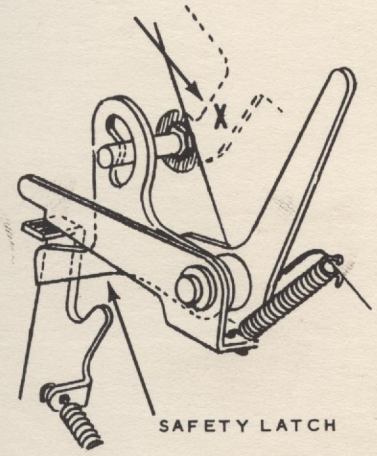


QUICK STROKE OPERATING SLIDE:

1. This slide is held in neutral by the main operating slide.
   a. Adjust the release latch, by forming, to permit a full hold on the offset on the contact and clutch operating arm, maintain slight clearance of latch above the top of the offset.



   b. Depress any operating key: Adjust the extended arm of the quick stroke slide, by forming at "X", to create a slight clearance between the safety latch and the offset of the switch closing and clutch operating arm (be sure the pin is on the high point of the aperture's forward wall.)



2. Index Blades' Control Operating Slide
   Flipper Control Operating Slide
   Total Trip Control Operating Slide

These three operating slides are held in neutral position by the control slides' restoring bail.

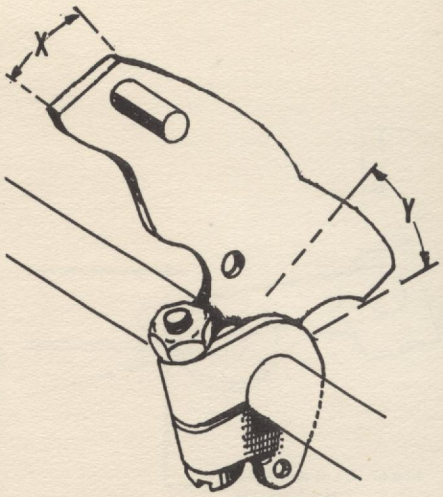
Adjustment: With the plus keystem down against the plus blocking bail, form the upper end of the restoring bail to create very slight clearance between the steps in the control operating slides and the plus blocking bail.

3. CHARACTER CONTROL OPERATING SLIDE:
   Adjustments:
   a. With the machine in neutral form the rearward extension of the right end plate of the rack arm restoring latch assembly against the rear extension of the character rack arm to permit the character type-bar to be held at the same height as the other type-bars.
   b. Plus key depressed, adjust the eccentric hexagon for the character bracket to permit slight clearance between the plus bracket and the step in the character control operating slide.

      NOTE: This last adjustment should be rechecked after adjusting the rack arms alignment.

PLUS, MINUS, AND NON-ADD FUNCTION

Refer to fold out Page 34-N.

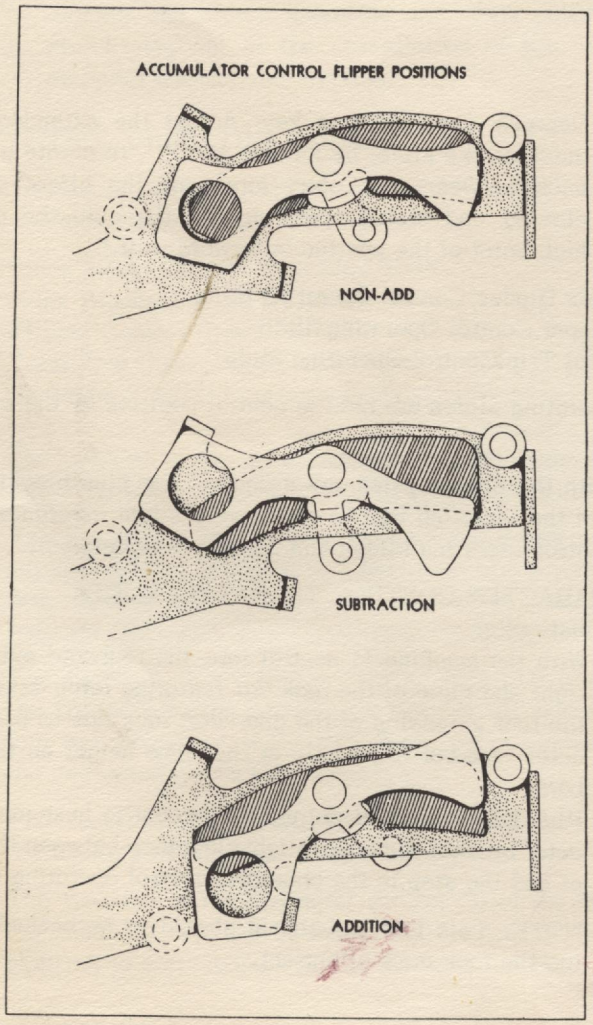


Before going into plus, minus and non-add functions, attention should be given to the two positions X and Y on the #2 and #3 main cams.

When the two rollers of the rack arms' restoring latch assembly are riding over either one of these cam positions there will be no movement of the rack arms, index blades or typebars. These two (X and Y) positions are important and will be mentioned in the various machine functions.

FLIPPER POSITIONS

This illustrates the positions which the flipper must assume while the rollers are still riding on the detent "X" cam surface at the beginning of any machine cycle in plus, minus or non-add.



In studying these three operations it will be found they differ only in the relationship of the large roller on #1 main cam to the flipper. The position of the flipper will control whether the accumulators are to be in mesh or out of mesh with the teeth of the rack arms during the forward and the return strokes. Therefore, if we learn one of these functions thoroughly we will easily understand the others, too.

The printing function will be identical to the printing function previously explained.

MINUS FUNCTION

The active control operating slides in minus operations are:

1. Flipper Control Operating Slide
2. Character Control Operating Slide
3. Quick Stroke Control Operating Slide

1. Depression of the minus keystem moves the minus blocking bail down into the path of the steps in the control operating slides. The keyboard operating slide trigger releases the main operating slide, starting the machine cycle. At the beginning of the forward stroke the operating slides' restoring bail roller drops off the clutch assembly cam thus permitting this bail to move forward. The active control slides, through spring tension, move forward until stopped by the depressed blocking bail (this occurs while the rollers are still on the X sections of the cams #2 and #3).

2. As the flipper control operating slide moves forward it causes the flipper to assume its minus position. As the stroke continues the roller on #1 main cam rides on top of the rail segment of the flipper control operating arm thereby holding this arm down during the forward stroke. Thereby the accumulators are held in mesh with the teeth of the rack arms. Also, during the forward stroke as the rack arm restoring latch assembly moves down and to the rear, the character control operating slide assumes its minus position. This raises the minus symbol to the printing line.

3. Toward the completion of the forward stroke the roller on #1 main cam depresses and then passes the forward end of the flipper. (Spring tension raises the forward end of the flipper again).

4. At the beginning of the return stroke the roller on #1 main cam engages the bottom edge of the flipper, driving the flipper against the upper limit lug on the flipper control arm. This action raises the flipper control arm and through the accumulator toggles' the accumulators are moved forward out of mesh with the rack arms. This action occurs before the aligning bar has disengaged from the rear teeth of the rack arms and while the rollers are still on the Y detent section of the cams. During the return stroke the roller rides under the rail segment of the flipper control operating arm, thereby holding the flipper control arm in its raised position. As the machine continues its return stroke the rear extension of the rack arms restoring latch assembly restores the character type bar and character control operating slide. The roller on the control operating slides' restoring bail rides the cam on the clutch assembly, thereby restoring all active control operating slides to normal.

5. After the rollers have returned to the X portion of the cams the roller on #1 main cam engages the rear flange of the flipper control arm, thereby moving this arm down. This straightens the accumulator toggles and positions the accumulator rearward into mesh with the rack arms' teeth.

   NOTE: The quick stroke operating slide is restored by the main operating slide on the return stroke of every machine cycle.

PLUS AND NON-ADD FUNCTION

These two functions are accomplished in the same manner as the minus function with the exception of the positions of the flipper.

PLUS FUNCTION

The flipper control operating slide will not be permitted to travel when the plus blocking bail is held down. Therefore, at the beginning of the machine cycle the roller on #1 main cam engages the flipper and through the flipper control arm movement it breaks the accumulator toggles. This positions the accumulators forward out of mesh before the two rollers have moved off the "X" detents of the camming surfaces. At the beginning of the return stroke the roller on #1 main cam engages the front upper edge of the flipper, driving the flipper control arm downward. This straightens the accumulator toggles and positions the accumulator rearward into mesh before the aligning bar disengages from the rear teeth of the rack arms.

NON-ADD FUNCTION

At the beginning of the forward stroke the flipper control operating slide will move the flipper into the non-add position. Therefore, there will be no flipper activity. The roller on #1 main cam will ride on top of the rail segment of the flipper control arm during both the forward and return strokes. As a result the amount set on the keyboard will be subtracted out of the accumulator during the forward stroke and be added into the accumulator during the return stroke.

TOTAL FUNCTION

Refer to fold out Page 35-N.

The operating slides which are active during a total operation are:

1. Quick Stroke Control Operating Slide
2. Index Blades Control Operating Slide
3. Flipper Control Operating Slide
4. Total Trip Control Operating Slide
5. Character Control Operating Slide

Stage I. Depression of the total key causes movement of the total and subtotal interlock. A small stud on this interlock positions the yoke out of the path of the adjustable stud. Therefore, the numeral key detent interlock will not be active during the machine cycle, thus permitting numeral key to be depressed.

Stage II. As the total key is depressed the keyboard operating slide trigger releases the main operating slide which then performs the same functions as during the printing. The total keystem is locked in its down position and its blocking bail is in position to stop the control operating slides in their forward travel.

Stage III. The machine starts its forward stroke and the control operating slides are permitted to move forward. The flipper control operating slide assumes the minus position. The index blades' shifting control operating slide, through two bell cranks and spring tension, positions the index blades to the right out of the path of the zero column latches and numeral keystems. The upper bell crank positions a blocking latch into the path of an offset of the main operating slide to prevent clearing of the keyboard at the end of the total cycle. The total trip control operating slide has moved forward.

a. This positioned the rear blocking bail into a notch in the clutch dog's blocking arm thereby stopping the forward stroke. This permits the complete total tripping before the forward stroke continues.

b. As the total trip operating slide completes its forward travel, through linkage, an actuating hook will strike the total tripper and breaks the total starting toggle. As this starting toggle is broken the total toggles' restoring shaft moves down out of the path of the individual toggles. The #1 toggle is never raised to the center line of its hinge point and it therefore follows the downward movement of the restoring shaft.

   1. #1 total hook moves into the path of the zero lug on the #1 accumulator gear.

   2. The heel of the toggle strikes the #1 rack arm restoring latch moving it out of the path of the restoring stud of the #1 rack arm. Through spring tension the rack arm begins to move, raising the #1 typebar until the accumulator gear zero lug is stopped by the total hook (in zero position).

c. Just before the accumulator gear travel is stopped, the zero lug activates a small bell on the total hook. Through this, a linkage movement breaks the second toggle. The #2 total hook moves into the path of the accumulator gear zero lug and the heel of the toggle assembly positions the #2 rack arm restoring latch out of the path of the restoring stud on the second rack arm thereby releasing #2 rack arm.

d. The above function continues in this same sequence until the last rack arm has been released and the last total toggle is broken. This last total toggle actuates a crank shaft, and an adjustable arm on the right end of this shaft strikes the tail of the blocking bail thus releasing the clutch dog blocking arm and permitting the machine to resume its forward stroke.

e. Near the completion of the forward stroke a stud on the #2 main cam resets the total toggles restoring blank. In turn this movement resets the starting toggle and the total toggles restoring shaft resets the individual total hook toggles.

NOTE: This resetting action takes place after the aligning bar has engaged the rear teeth of the rack arms.

f. As the machine completes its forward stroke a blocking latch, through spring tension, moves into the path of an offset on the total starting toggle (preventing breaking of this toggle during the return stroke). Also, an offset on the #3 main cam operates the auxiliary keyboard's locking bail, thus locking the auxiliary keyboard's index segments with the amount cleared from the accumulator. A small holding latch moves in to lock the auxiliary keyboard's locking bail until the return stroke is nearly complete.

The machine at the same time has completed a regular printing function as previously described. It will be noted that the total hooks and the rack arms were released in sequence from right to left and the accumulator gears were cleared to zero in this sequence. This is necessary because of the crawl carry-over system. Looking back to the crawl carry-over it will be seen that as the accumulator gears are cleared to zero from right to left, the fractional carry-overs were automatically wiped out.

Stage IV. Return Stroke:

1. The return cycle is a normal minus return cycle. Near the completion of this return cycle, when the control operating slides were normalized through the restoring bail operated from the cam on the clutch assembly, the flipper control operating slide and the total trip control operating slide, and the index blade shifting control operating slide were normalized.

2. However, the blocking latch, operated from the upper bell crank of the index blade's shifting control operating slide, is still blocking the main control operating slide thus preventing the keyboard clear. This is released as the control operating slides' restoring roller has passed the peak of the cam, permitting the main operating slide to come to rest against the roller on the keyboard operating slide trigger which was lowered as the total keystem was released.

3. Also, near the completion of the return cycle, after the rollers have reached the dwells of camming surfaces "X", the rack arms' restoring latch assemblies right roller stud operates the tail of the blocking blank thereby moving it out of the path of the offset on the total starting toggle assembly. A small stud on the #3 main cam operates the tail of the holding latch, releasing the auxiliary keyboards blocking bail. This permits the auxiliary keyboard index segments to normalize through their spring tensions.

SUB-TOTAL FUNCTION

The sub-total function is identical to that of the total function with the exception that the sub-total symbol will print and a small flexible latch on the flipper control operating slide blocks this slide to assume a non-add position. Therefore, there will be no flipper action and the accumulators will remain in mesh on both the forward and return strokes.

NEGATIVE TOTAL FUNCTION

Refer to fold out Page 36-N.

Control operating slides which are active:

1. Quick Stroke Control Operating Slide
2. Index Blades Control Operating Slide
3. Flipper Control Operating Slide
4. Total Trip Control Operating Slide
5. Character Control Operating Slide

Three cycles are necessary to complete a negative total function. Namely: total, subtract, total.

1st Cycle	Clear Out
2nd Cycle	Subtract
3rd Cycle	Clear Out

On all three cycles the flipper will assume a minus position.

Sample problem showing the mechanics applied to mathematics when subtracting a number from zero.

For example, subtracting $2.25 from an empty accumulator.

(imaginary one) 0 0 0 0 0 0 0

−2.2 5

9 9 9 9 7.7 5 These are the figures in the accumulator after $2.25 has been subtracted from an empty accumulator. These figures will be cleared out during the first, or total cycle; this same amount will be locked onto the auxiliary index segments. During the second, or minus cycle, this amount will be subtracted from the accumulators (cleared to zero) resulting in an amount being left in the accumulators. This amount is cleared out and printed during the third or total cycle. CR symbol will print instead of the total symbol (*) 0 0 0 0 0 0 0

−9 9 9 9 7.7 5

2.2 5

With a negative amount in the accumulators and the total key depressed the machine goes through a regular total function as previously explained. The index blades move to the right before the total trips, this action moves the trap door into the path of the rear extension of the last rack arm. As this rack arm travels upward, between the eighth & ninth position, it releases the trap door, allowing the negative total starting arm, through spring tension, to move forward.

NOTE: This point is where the negative total function starts.

When the negative total starting arm moved forward the control bails on the negative total bail shaft were released and are now ready to perform their functions as dictated by the cams on the negative total cam shaft.

1. The paper spacing arm is blocked during the first two machine cycles preventing paper spacing.
2. The linkage to the hammer trigger guide bracket is held inactive during the first two machine cycles to prevent firing of the hammers.

3. The feed pawl for the four toothed ratchet gear is released permitting the feed pawl, through the four tooth ratchet gear, to rotate the negative total cam shaft 1/4 revolution during each return stroke.

4. The operating slide blocking latch drops, permitting the main operating slides' blocking lever arm to actuate the slide blocking lever. This blocks the main operating slide preventing its return movement during the 1st and 2nd machine cycles. Consequently, the total key will not restore at the end of the 1st and 2nd machine cycles and the machine will automatically cycle for the 2nd and 3rd cycles.

1st Return Stroke: During the 1st return stroke the negative total cam shaft is rotated 1/4 revolution, this causes:

1. The index segments locking cam to operate the index segments latch bail into engagement with the index segment blocking arm. This prevents the release of the auxiliary keyboard index segments at the end of the 1st machine cycle.

2. The negative total cam (outside the right side frame) moves away from the lower end of the control slide block operating lever. As the total trip control operating slide is normalized, the blocking offset moves into its blocking position thus blocking the total trip operating slide. This prevents the total trip operating slide from moving forward at the beginning of the 2nd machine cycle.

2nd Machine Cycle: During the forward stroke of the 2nd machine cycle the amount stored in the auxiliary keyboard index segments will be subtracted from the previously cleared accumulators. Also, during this forward stroke the control operating slides' restoring arm moves away from the slide blocking arm latch, allowing this latch to engage the blocking offset of the control slide block operating lever. This prevents forward movement of the total trip control operating slide during the return stroke.

Return Stroke: During this return stroke the negative total cam shaft is rotated another 1/4 revolution.

1. The spacing and non-print cam operates its bail thereby unblocking the paper spacing arm and also the linkage to the hammer firing triggers guide bracket thus freeing the hammers to fire and the paper to space during the 3rd machine cycle.

2. The index segment locking cam releases the segments latch bail, permitting the auxiliary keyboard index segments to normalize at the end of the return stroke.

3. The negative total cam (outside the right side frame) moves away from the lower end of the control slide block operating lever. The operating slides' restoring arm normalizes the slide block arm latch, permitting the control slide block operating lever, through spring tension, to position its blocking offset up, thus allowing the total trip control operating slide to be active at the beginning of the forward stroke of the 3rd cycle. Also, this blocking offset is in position to block the character control operating slide to index the CR symbol.

3rd Machine Cycle: The 3rd machine cycle is a regular total cycle, as previously described. The amount in the accumulators will be cleared out of the accumulators and printed with the CR symbol.

During the return stroke the negative total cam shaft was again rotated 1/4 revolution at which time the cam on the negative total cam shaft actuates the operating slide block lever arm, moving the operating slide blocking lever out of the path of the extension of the main operating slide. This permits the main operating slide to return to normal and be relatched by the keyboard operating slide trigger.

Also, the negative total cam (outside the right side frame) contacted the lower end of the control slide block operating lever, through spring tension, normalizing the control slide blocking arm at the completion of the 3rd cycle.

After the completion of the three machine cycles, it will be noted that the negative total starting arm bail and the operating slide block arm latch have not returned to their normal position. On the next machine cycle the negative total cam shaft will be rotated the last 1/4 revolution and the single cam on the negative total cam shaft will actuate and by-pass the roller on the feed pawl release bail. This camming action will relatch the negative total starting arm underneath the trap-door.

NEGATIVE SUB-TOTAL FUNCTION

Refer to fold out Page 36-N.

Control operating slides which are active:

1. Quick Stroke Control Operating Slide
2. Index Blade Control Operating Slide
3. Flipper Control Operating Slide
4. Total Trip Control Operating Slide
5. Character Control Operating Slide

Four cycles are necessary to complete a negative sub-total function. Namely: Total, subtract, total, subtract.

1st Cycle	Clear out accumulator
2nd Cycle	Subtract from cleared accumulator
3rd Cycle	Clear out accumulator
4th Cycle	Subtract from cleared accumulator

On all four cycles the flipper will assume the minus position.

A negative sub-total, is accomplished in much the same manner as the negative total function.

With a negative amount already in the accumulators a depression of the sub-total key causes the sub-total blocking bail to move into position to block the control operating slides in their forward travel.

As the negative total starting arm was released and the main operating slide's block lever moved up to block this slide, the same offset which blocks the main operating slide's return also actuated the flexible latch on the flipper control operating slide. This holds the latch out of the path of the sub-total blocking bail thereby permitting the flipper control operating slide to assume a minus position on all four machine cycles.

During the first forward stroke the character typebar is permitted to raise to its maximum height, and the stud on the character rack arms bracket contacts the upper fork of the negative total cam shaft shift arm. This positions the lower camming offset into the path of the screw-head on the negative total cam shaft. It is held in this position by a toggle spring.

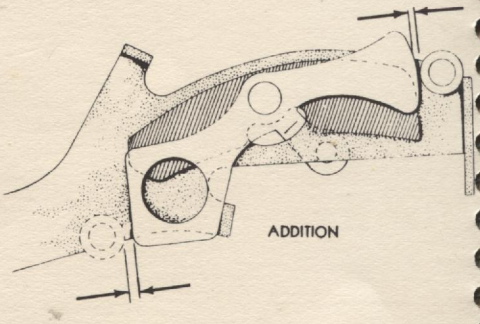
During the first return stroke the negative total cam shaft is rotated 1/4 revolution. The screw head moves across the camming surface thereby shifting the negative total cam shaft to the left to permit the right hand set of cams to take over control of the negative total control bails.

1. The paper spacing and hammer firing will be blocked during the first three machine cycles in the same manner as the negative total operation.
2. The main operating slide will be prevented from returning during the first three full cycles. Consequently, the sub-total key will not restore. This provides for the 2nd, 3rd, and 4th machine cycle.
3. The auxiliary keyboard index segments will be locked during the 2nd and 4th machine cycles. Therefore the amount cleared out of the accumulators during the 3rd cycle will be locked on the auxiliary keyboard's index segments to be printed and also be subtracted out of the cleared accumulators. As a result the negative amount is left in the accumulators at the completion of a negative sub-total function.

   The negative total cam (outside the right side frame) operates the control slide block lever during the return stroke of the 3rd cycle. This prevents the total trip control operating slide's movement during the fourth cycle and also blocks the character control operating slide, permitting the printing of the CR symbol.

   During the return stroke of the 4th cycle, when the negative total cam shaft is rotated the last 1/4 revolution, the screw head is actuated by the permanent shift cam, moving the negative total cam shaft to the right, (normal position) and the negative total starting arm is back in its relatched position under the trap door.

CAM SHAFT ALIGNMENT



1. Check for equal drop off clearance between the roller on the #1 main cam and the flipper. With the machine in neutral and a full stroke forward, adjustments are made to lengthen or shorten the connecting link between the #1 main cam and the clutch assembly.

NOTE: This adjustment is important as #2, #3 and #4 main cams are aligned with respect to #1 main cam. This adjustment affects the timing relation of the accumulators shifting in or out of mesh before movement of the rack arms, index blades and the type bars at the beginning of the forward and return strokes and also at the end of a minus cycle.

2. Machine in neutral: With K. T. #171 straddling the restoring pin on #2 main cam, adjust the mercedes clamp to permit the cut out on K. T. #171 to squarely locate on the upper accumulator cross shaft.
3. Machine in neutral: With the pin of K. T. #171 in the hole on #3 main cam adjust #3 main cam to permit the cut out to squarely locate on the same cross shaft.

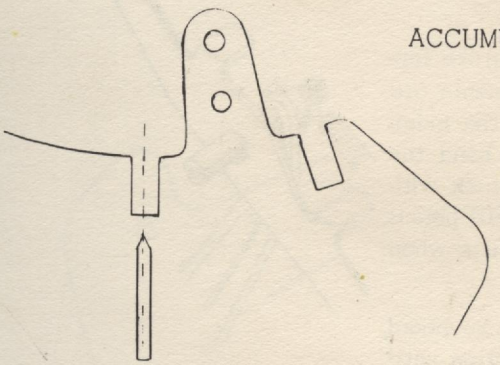
4. Cycle the machine a full stroke forward: With the pin of K. T. #171 in the hole of #4 main cam, adjust #4 main cam to permit the cut out to squarely locate on the same cross shaft.

RACK ARM ALIGNMENT

1. With the accumulator section removed install K. T. #144. Check with K. T. #144 that the nose of the tool centrally locates between two teeth of each rack arm. Adjustments are made by the eccentric collars of the rack arms' restoring latches.

NOTE: If all the rack arms are out of adjustment in one direction install rollers of larger or smaller diameter provided the roller arms are not bent. NOTE: Under normal conditions it is unnecessary to replace rollers.

2. With all #1 numeral keys depressed cycle the machine a full stroke forward: Adjust the aligning bar rollers' eccentrics to position the aligning bar fully into the rear teeth of the rack arms without cramping. Under the same condition check with K. T. #144 that the nose of the tool centrally locates between two rack arm teeth. If adjustments are necessary bend the rear extension of the rack arms up or down as close to the hub as possible using aligning tools K. T. #95 and #95-A.



ACCUMULATOR ADJUSTMENT

1. Adjust the accumulator detent by forming the detent strip to permit all of its prongs to be centrally located with the apertures for the accumulator shaft. If necessary adjust the individual prongs.

2. Install the accumulator section in the cradle and shim if necessary to permit the detent prongs to centrally locate the accumulator gear teeth, and at the same time allow for .010" overall sidewise play.

3. With the accumulator toggles straight and limited against the cross shaft; check for slight clearance for the accumulator gear teeth to rotate past the detent prongs.

NOTE: On the simplex machines this adjustment is fixed, determined by the accumulator shifting toggles.

KEYBOARD ALIGNMENT

1. With all ones depressed on the keyboard, cycle the machine a full stroke forward. With the aligning bar fully meshing the rack arm rear teeth, check for proper cam-down action, (but make no adjustments).

NOTE: By proper cam-down action it is meant that the aligning bar moves the rear end of the rack arms slightly downward creating a slight clearance between the depressed keystems and the stop lugs on the index blades. Thus the aligning bar determines the horizontal printing line and also the rack arms' correct position to permit accumulator shifting at the beginning of the return cycle.

2. With eights depressed on the keyboard, cycle the machine a full stroke forward and check for proper cam-down action. We have now checked the two extreme limits of the index blades. If adjustments are necessary bend the upward extensions of the rack arms to equalize.

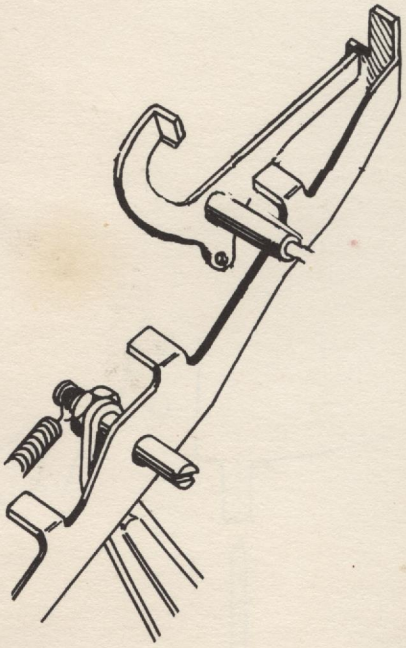
3. Check 2's, 3's, 4's, 5's, 6's, and 7's for proper cam-down action, if any adjustments are necessary bend the individual lugs on the index blades.

4. With 9's depressed on the keyboard, cycle the machine a full stroke forward. Adjust the 9's limit bar to permit the same cam-down action: i.e., the rear extensions of the rack arms should have a slight clearance from the 9's limit bar. Check this adjustment during a total or sub-total function with all 9's in the accumulator gears. Before continuing the forward cycle, after the accumulators have cleared to zero, there should be a slight clearance between the total hooks and the accumulator gear zero lugs. If no clearance exists refine the 9's limit bar adjustment.

5. With the machine in neutral and the keyboard removed check for slight sidewise clearance between the upper extensions of the rack arms and the index blades. For individual adjustments bend the upper extension of the rack arms either left or right. If all these clearances are poor, adjust the tails of the bell cranks where they contact the index blades shifting control operating slide.

6. With nothing on the keyboard, cycle the machine a full stroke forward and check for proper cam-down action. If adjustments are necessary, the small left offset on the rear extension of the index blades may be formed slightly. In this same position bend the blocking extension of the zero column latches to be flush with the top of the zero stop lugs on the index blades. This will permit the zero column latches to raise above the zero stop lugs when numeral keys are depressed.

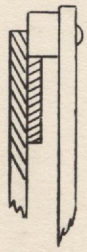
7. Keyboard clear: With numeral keys depressed across the keyboard, cycle the machine through a plus, minus or non-add function until the roller on the main operating slides' restoring arm is on the peak of the clutch assembly cam. Adjust the offset on the keyboard master clearing comb against the keyboard clearing bell crank to clear the numeral keys, for individual offsets on the master clearing comb.

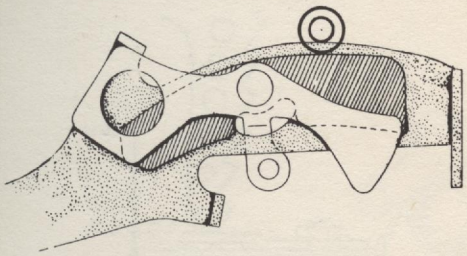


FLIPPER ADJUSTING SEQUENCE

1. Machine in neutral: Loosen all three clamps on the flipper control shaft. Adjust the shaft sidewise to have slight clearance from the right pivot screw (bushing) with both toggle arms limited against the cross shaft with the arms having minimum play with the accumulator assemblies' end plates and tighten the clamps.

2. With the flipper control operating arm at right angles to the shaft, shift the control arm sidewise to permit the roller on #1 main cam to limit the flanges. (Full hold on the lock ledge).





3. Operate the machine partially forward in a minus (forward) cycle. Keep the two toggle arms limited against the shaft. Hold the flipper control arm flange against the roller on the #1 main cam and tighten the main flipper operating arm clamp. Under the same condition check for full movement of the flipper to its limit lug. If any adjustments are necessary, bend the arm controlling the flipper; this comes from the flipper control operating slide. Note: If the flipper control arm is equipped with a hair spring, bend the upper part of the spring downward to meet the cross shaft.

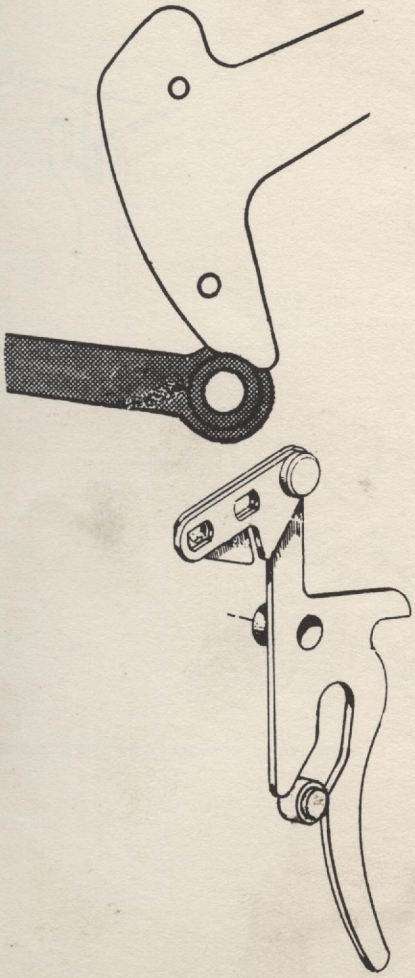
4. Cycle the machine a full stroke forward. Manually raise the flipper control arm. Adjust the friction washer collar to safely hold the flipper control arm in its raised position.

5. Cycle the machine partially through a minus return stroke. If the flipper control arm is equipped with a hair spring, bend the lower part up to meet the cross shaft.

6. Complete the minus return stroke and check the rear edge of the flipper control operating arm to fully move the flipper control operating arm downward after the two rollers on the rack arms' restoring latch assembly have reached the dwells on camming surfaces "X" on #2 and #3 main cams.

NOTE: If this adjustment is poor, double check #1 adjustment of the cam shaft alignment. CAUTION: Under no circumstances bend the rear edge to compensate.

If the foregoing adjustments were made correctly, the forward end of the flipper should rest on the lower limit lug of the flipper control operating arm.



UPPER ROCKER SHAFT – ADJUSTING SEQUENCE

1. Machine in neutral: Adjust the paper spacing operating cam, by the mercedes clamp, to locate the paper spacing assemblies' roller in the indenture of the cam.

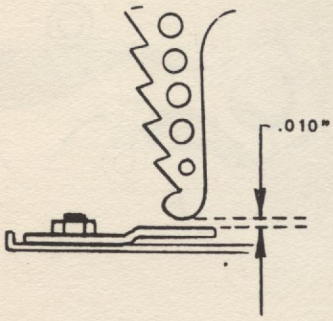
2. Cycle the machine partially in a plus, minus or non-add forward stroke. Stop just before the two rollers leave the dwells of the camming surfaces "X". Adjust the two clamped arms on the left and right side of the printing section to permit their rollers to locate in the ribbon guide brackets operating cams as shown in sketch.

3. Continue the forward stroke until the two rollers on the rack arm restoring latch assembly have reached the dwells on camming surfaces "Y". Adjust the eccentric hexagonal sleeve on the linkage for the aligning bars operating cams to start the forward movement of the aligning bar. Also check that the left operating cam actuates the left roller at the same time the right cam actuates the right roller. If an adjustment is necessary move the left cam.

4. Continue the forward stroke until the roller on #1 main cam has approximately 1/16" travel left on its forward stroke. Adjust the hexagon eccentric sleeve for the linkage to the hammer triggers guide bracket to release the firing triggers from the offset of the hammers. This permits the hammers to fire against the type bars.

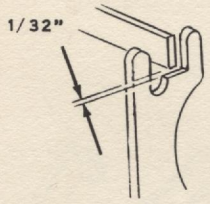
5. Cycle the machine in its full return stroke. Adjust the ribbon guides adjusting straps to hold the ribbon parallel against the type bars.

6. Cycle the machine in forward and return cycles, alternately advancing the ribbon ratchet gears. Check for equal displacement of four teeth on the forward and return cycles. If adjustments are necessary, the feed cam on the left may be slightly formed.

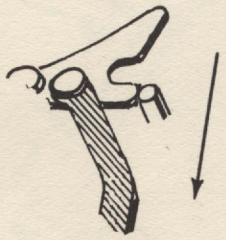


TOTAL AND SUB-TOTAL ADJUSTING SEQUENCE

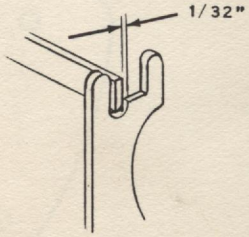
1. Machine in neutral: Adjust the zero limit blank on the motor base by forming to permit slight clearance between this blank and the rear teeth of the rack arms.



2. Machine in neutral: Adjust the cycle stop bracket, by forming, to clear above the clutch dog blocking arm by about 1/32".



3. Depress the total key: Set the adjustable stud on the main operating slide to clear the numeral keys' detent interlock yoke with a slight rub.



4. Cycle the machine partially in a forward stroke. Adjust the cycle stop bracket, by forming, to move down into the clutch dogs blocking aperture with approximately 1/32" clearance.

5. Refer to Figure 1, page 20-N. Disconnect the starting toggle spring and back of #2 eccentric. Adjust #1 eccentric to permit the toggle to straighten fully with a very light bite. In this same position, check to see that the individual toggles restoring shaft is not limited on any individual toggle.

6. Refer to Figure 1, page 20-N. Adjust #2 eccentric for maximum toggle beyond the hinge center line. To check for this proper toggle setting, there should be two conditions. (A) Raise the front of the machine from one to two inches from the table and drop it; the toggle should not break. (B) Manually cycle the machine in a total, the toggle must break.

7. Refer to Figure 2, page 20-N. With zeros in the accumulators, cycle the machine in a total, slowly. Retard the starting toggle breaking. Adjust the offset of the #1 rack arm restoring latch against the heel of the #1 individual toggle assembly to release the #1 rack arm after the total hook is halfway in the path of #1 accumulator gear's zero lug.

TOTAL STARTING TOGGLE

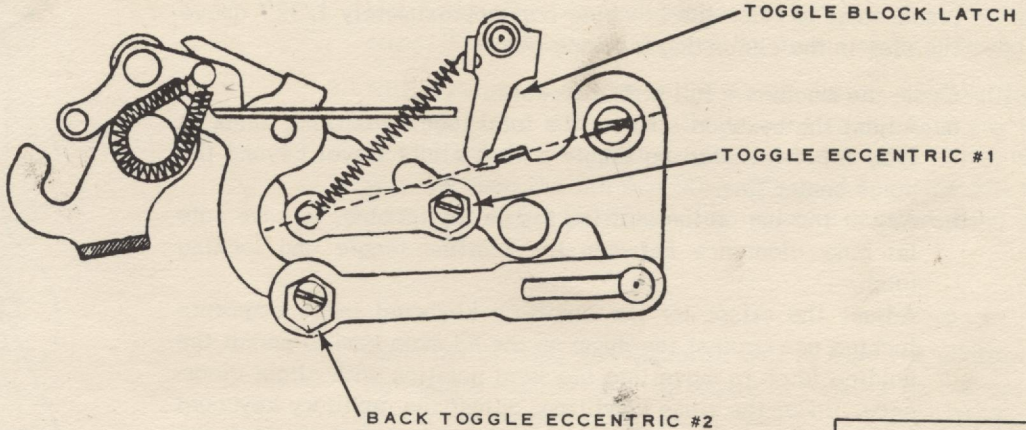


FIGURE 1

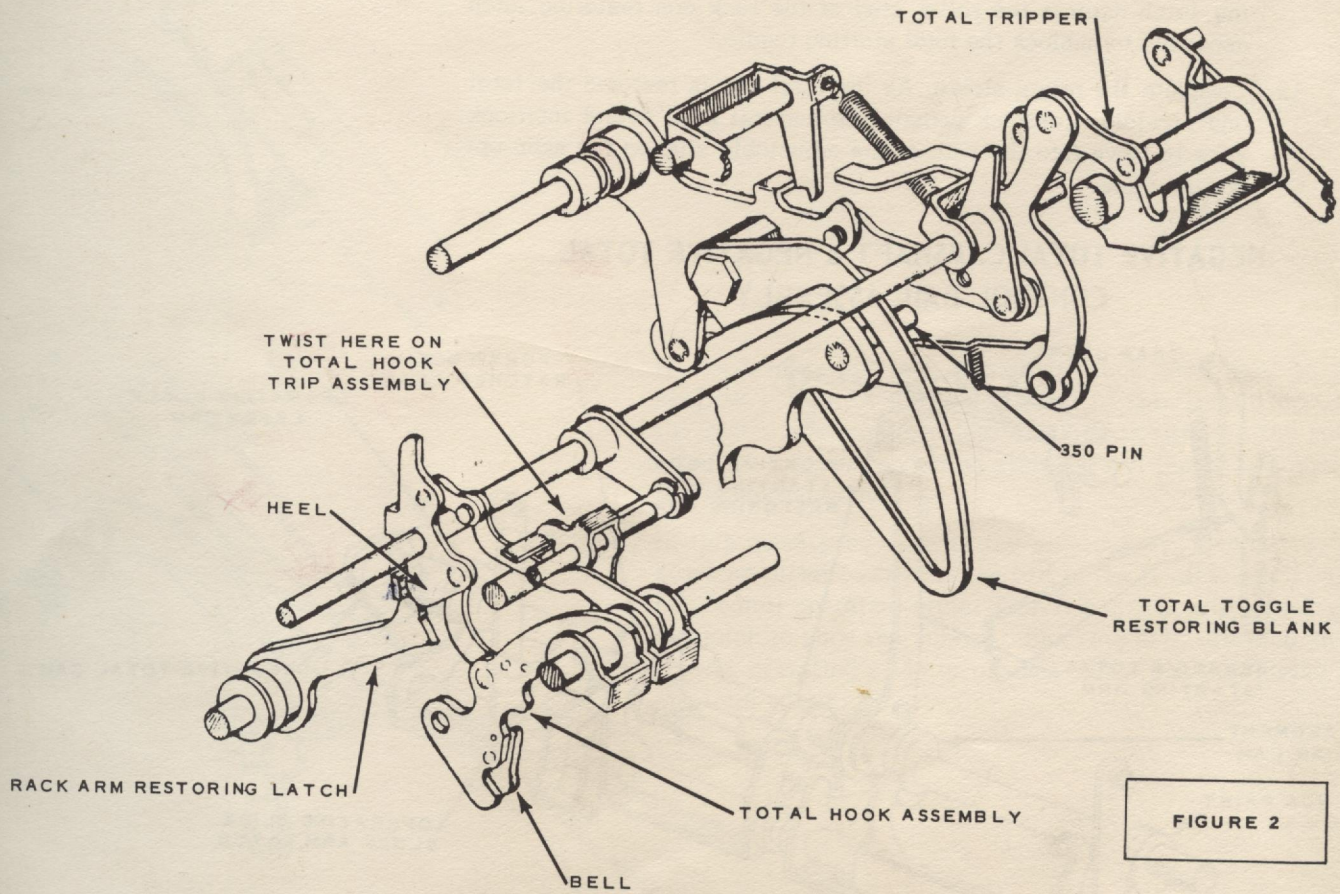
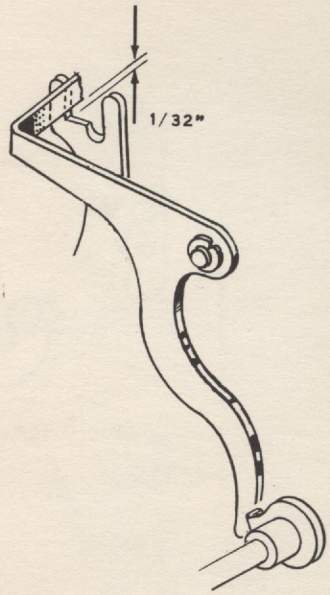


FIGURE 2

8. After the total hook has moved in all the way, adjust the offset of the toggle breaker by twisting (see figure 2.) to break the next toggle as late as possible, yet safely.

NOTE: This sequence is repeated for breaking each total hook toggle.

9. When the last toggle has broken, set the adjustable blank on the crank shaft to raise the blocking bail approximately 1/32" above the step in the clutch dog blocking arm.

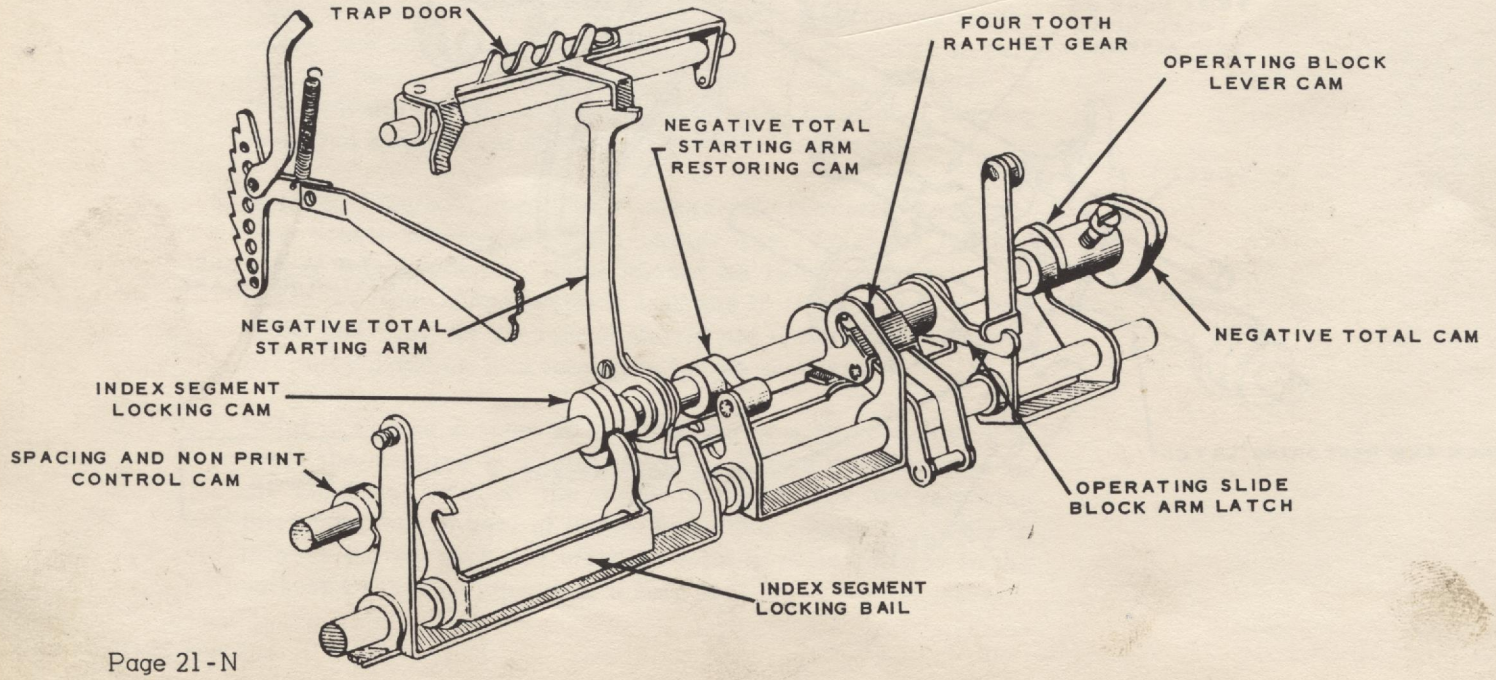


10. Cycle the machine a full stroke forward:
    a. Adjust the hexagon stud for the total toggle restoring blank to fully reset the starting toggle with a slight travel beyond the hinge center line.
    b. Adjust the lug on the starting toggle, by forming, to have safe latching clearance between the starting toggle and locking latch.
    c. Adjust the offset for the auxiliary keyboard index segments locking arm against the hump on the #3 main cam to permit the holding latch to move into blocking position with slight clearance. Under the same condition, adjust the auxiliary keyboard locking bail by its adjusting spring screw to fully lock the auxiliary index segments snugly.

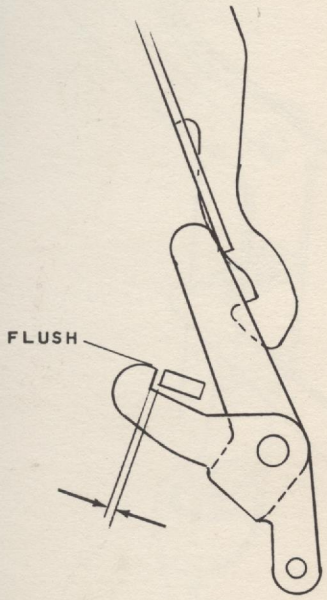
11. Cycle the machine in its return stroke until the two rollers of the rack arm restoring latch assembly have just arrived on the dwells of camming surfaces "X" on the 2nd and 3rd main cams. In this position bend the tail of the holding latch against the small pin on #3 main cam to cause the releasing of the auxiliary keyboard index segments. In this same position bend the tail of the blocking latch against the roller stud of the rack arm restoring latch assembly to unblock the total starting toggle.

12. Complete the return stroke. As the total key is restored the total and sub-total interlock permits the numeral keys' detent interlock yoke to move into the path of the adjustable stud on the main operating slide.

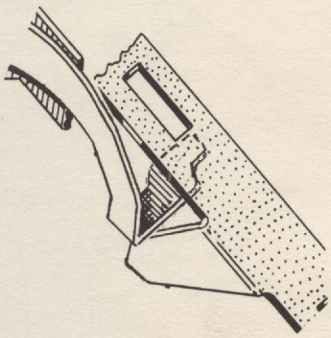
NEGATIVE TOTAL CAMSHAFT & NEGATIVE TOTAL CONTROL BAIL ASSEMBLY

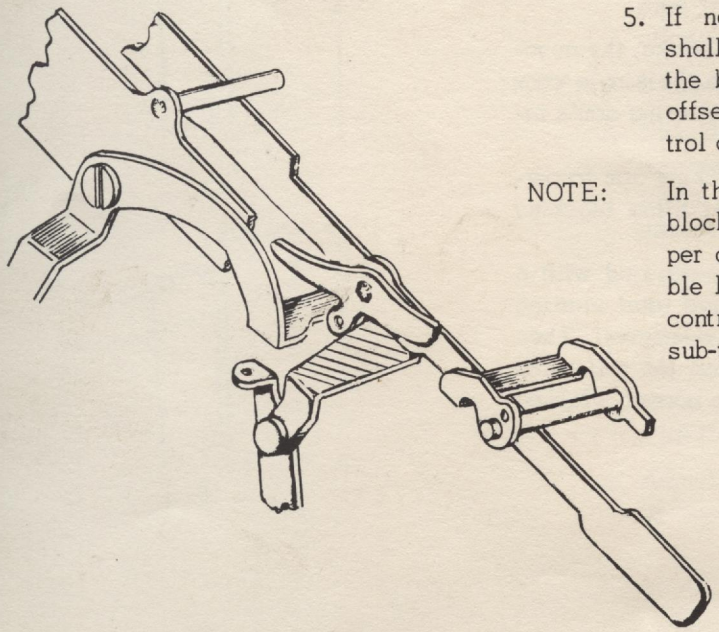


NEGATIVE TOTAL FUNCTIONAL ADJUSTING SEQUENCE



1. Machine in neutral with the negative total cam shaft screwhead against the permanent shift cam: Align all the negative total control bails centrally with respect to the left negative total control cams. This adjustment is made by means of set screwed collars.
2. With a negative amount in the accumulators, depress the total key and cycle the machine in its forward stroke until the total trips. Retard the movement of the last rack arm until it has arrived half way between the 8th and 9th position. Adjust the tail of the trap door by forming, to release the negative total starting arm at this time.
3. Form the spacing and non-print bail to meet the shallow portion of its control cam. Adjust the toggle linkage by its two set screws to permit the paper spacing block hook to be flush with the top of the offset on the paper spacing bracket. In this same position form the offset of the linkage to the hammer trigger guide bracket to permit the offset on the left clamped arm to pass the lower hook of the linkage with slight clearance. (on forward cycles).
4. Check the operating slide blocking latch to release the operating slide blocking arm. If adjustment is necessary, form the bail at the lower end of the latch.





5. If necessary, form the operating block lever bail to meet the shallow portion of its control cam. At this time it should permit the block lever to move into blocking position in the path of the offset on the main operating slide without limiting against the control operating slides.

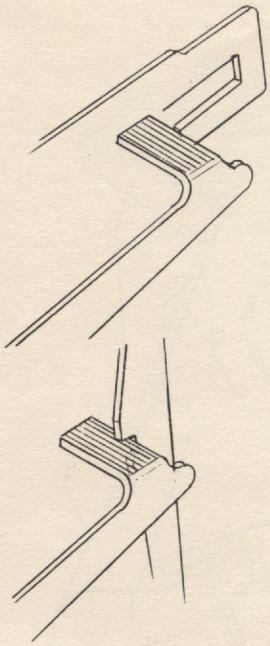
NOTE: In this same position with the sub-total key depressed, bend the blocking offset to operate the tail of the flexible latch on the flipper control operating slide. This adjustment will permit the flexible latch to pass the sub-total blocking bail, allowing the flipper control operating slide to assume minus position during negative sub-total operations.

6. Operate the machine into the return stroke of #1 cycle. Check for free movement of the feed pawl for four toothed ratchet.

7. Check the index segments' negative locking bail. Its hook should have 1/2 hold on the auxiliary keyboard index segments' locking arm. If necessary form the bail. In this same position, check the locking arm relation to the hook to assure that the index segments are held in a snugly locked position. Bend the locking arm toward the hook if necessary.

8. With the control slide block operating lever against the negative total cam (outside the right sideframe) check its upper offset to be in the path of the lower extension of the total control operating slide.

   Adjustment: Form the offset lug to be at a 90° angle with the body of the block operating lever. The offset should, at the same time, center with the square step of the slide block arm latch. In this position bend the tail of the latch to permit a slight clearance between the flanges on the square step and the offset of the block operating lever.



   2nd Return Stroke: The adjustments necessary to perform the 2nd return stroke functions have already been made, however, it is advisable to check;

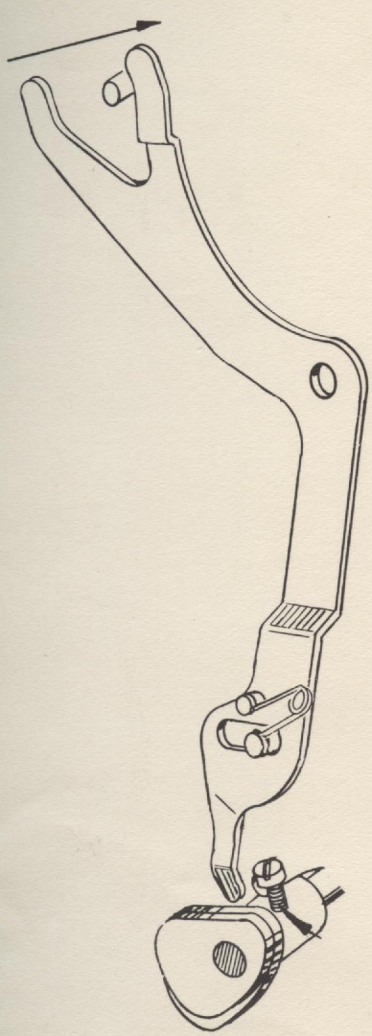
   1. The unblocking of the paper spacing arm.
   2. The releasing of the auxiliary keyboard index segment latching bail.
   3. The positioning of the control slide block operating lever to create the total trip and the printing of the CR symbol during the 3rd cycle.

   3rd Return Stroke:
   1. Check the main operating slide blocking lever to unblock the the main operating slide.
   2. Check the normalizing of the control slide blocking arm at the completion of the 3rd cycle.

The negative total cam shaft has now rotated 3/4 of one revolution, and it will require one more machine cycle to normalize it.

Depress any operating key. Cycle the machine. On the return stroke, the negative total cam shaft will rotate its last 1/4 revolution. While the single control cam is at dead center on the roller of the negative total starting arm's return bail make two adjustments.

1. Form the offset on the main operating slides blocking arm to permit slight relatching clearance of the operating slide blocking latch.
2. Loosen the screw on the negative total starting arm and with a screwdriver in the adjusting slot, set the negative total starting arm to be relatched by the trap door with slight overtravel. Then complete the return cycle, the single cam will pass the roller and the negative total starting arm will then return to normal, blocked by the trap door.

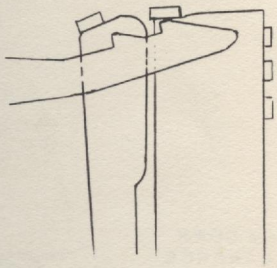


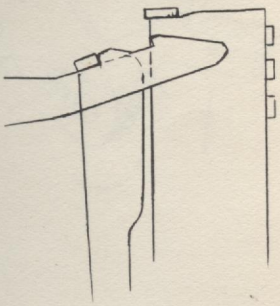
NEGATIVE SUB-TOTAL ADJUSTING SEQUENCE

With a negative amount in the accumulators, depress the sub-total key. Cycle the machine a full stroke forward in its 1st cycle. It will be noted that the character type bar is permitted to travel its maximum distance. As the character control operating slide travels forward, the pin on the character bracket operates the yoke of the negative total cam shaft's shift arm. Through its toggle spring the lower camming surface is positioned all the way and held in the path of the screwhead of the negative total cam shaft. During the 1st return stroke the negative total cam shaft is rotated 1/4 of one revolution, the screwhead engages the camming surface. This shifts the negative total cam shaft to the left, thus bringing the second set of control cams into position to take over control of the negative total control bails thereby permitting four cycles to be accomplished as called for during a negative sub-total function.

During the return stroke of the 4th cycle the screwhead engages the permanent shift cam thereby positioning the negative total cam shaft to the right, its normal position.

NOTE: The negative total cam shaft is held in either its right or left position by the double check pawl on the square block of the shaft.





PRINTING SECTION ADJUSTMENT

1. With 9's on the keyboard, cycle the machine a full stroke forward. Check the type bars to be parallel to one another. If necessary form the individual type bars. At the same time check the spring clips which lock the type bars to the rack arm to have no sideplay.

NOTE: If sideplay is apparent it may cause horizontal shadow print.

2. With O's on the keyboard, cycle the machine partially through the forward stroke. Check for a slight clearance between the hammer firing triggers and the offset on the hammers. If adjustments are necessary, bend the offset lugs on the type bars.

3. With a numeral key depressed in the left row, cycle the machine in its forward cycle until the hammer restoring shaft has moved away from the lower end of the hammers. Starting from the left and working to the right, adjust the carry-over offsets, by twisting the lower end of the hammers, to permit the hammers to line up parallel with the hammer triggers guide bracket.

4. Adjust the friction straps of the ribbon spool posts against their upright shafts to slightly tension the ribbon while advancing.

CARRIAGE ALIGNMENT

1. Loosen the four screws in the carriage back plate. Adjust the carriage up or down for perfect horizontal printing alignment. To check this adjustment depress all 8's on the keyboard; operate the machine thru a complete plus, minus or non-add cycle under power. The 8's should print equally sharp on the top and bottom.

2. Manually cycle the machine thru a return stroke. Adjust the eccentric hexagon sleeve for the platen ratchet gear check pawl to permit the check roller to drop between teeth of the ratchet gear after the feed pawl has advanced the platen. If this adjustment is not correct we may get vertical shadow prints due to the roller dropping in from the vibration when the hammers fire on the forward stroke.

NOTE: If the motor section has been removed from the body of the machine, after reinstalling the motor section but before tightening the four screws on the lower end of the printing section, install the carriage and tighten the back plate hooks. Then pull the lower end of the printing section to the rear into the cut outs in the back plate, and tighten the four screws. If this procedure is not followed, the aligning bar and other components in the printing section may be found to be out of adjustment.

Originally, when the machine was built, the printing section was lined up in this manner.

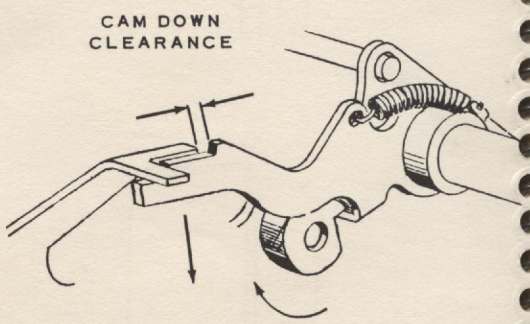
Special Note: In the outlined adjusting procedure it is assumed that shafts, operating slides and all moving parts are straight and free to move without any binds.

THE 11th RACK ARM LATCH

The function of this latch is to block the last rack arm in its zero position during normal plus, minus, and non-add machine operations.

During total, sub-total, negative total and negative sub-totals, when the total starting toggle is broken, the cam on the end of the total toggles' restoring shaft pivots this latch out of the path of the last rack arm's upper extension. This allows the last accumulator gear to clear to zero. Also, during negative total operations the rear extension of this rack arm contacts the trap door to release the negative total starting arm.

The second step of the rack arm latch prevents the last rack arm from travelling its full distance at the beginning of a total or sub-total return stroke, when the aligning bar has moved out of engagement with the teeth of the rack arms. This prevents the trap door from releasing the negative total starting arm at the incorrect time.



THE 11th RACK ARM LATCH ADJUSTMENTS

1. Machine in neutral: Bend the upper extension of the 11th rack arm to be flush with the first step of the latch.

2. With nothing on the keyboard, cycle the machine partially thru a forward stroke of plus, minus, or non-add. Form the upper extension of the 11th rack arm against the first step on the latch to permit the rear teeth of the 11th rack arm to be in straight horizontal alignment with the other rack arms' teeth.

Continuation of 410-11-011 Service Training Material

CONTINUATION OF 410-11-011 SERVICE TRAINING MATERIAL

Basically this model is identical to that of the 410-11-011. It is equipped with the additional mechanisms necessary to perform the added functions of this model.

With the accumulator control lever in "A" position and the transfer lever positioned to the rear, all the machine functions and adjustments are the same as described in the 410-11-011 service training material and the machine will function as a simplex machine.

The accumulator control lever will be locked during machine cycles. The shifting of the accumulators is slightly different and during a negative total operation the negative total cam shaft will rotate one complete revolution during three machine cycles. These three items will be covered later.

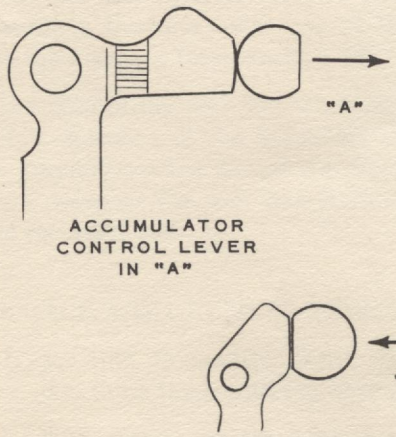
With the accumulator control lever in "B" position the function will be exactly the same with the exception that the accumulator activities will be in the "B" accumulators, a duplicate set of "A".

TWO ACCUMULATORS "A" AND "B"

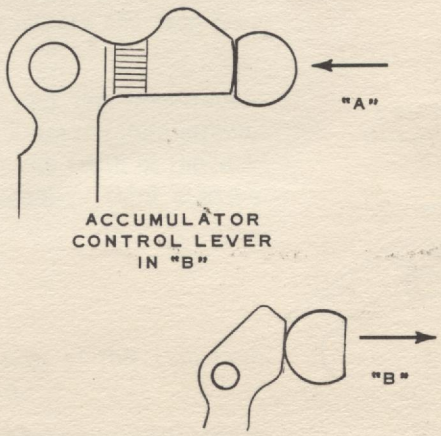
Machine in neutral: With the accumulator control lever in "A" the upper accumulators will be in mesh with the rack arm teeth and "B" or lower accumulators will be out of mesh.

With the accumulator control lever in "B" the lower accumulator will be in mesh and the "A" or upper accumulators out of mesh.

This is accomplished through the accumulator selector fan rotating pinions which are coupled, through square shafts, to the accumulator shifting cams. It will be noted that the accumulator shifting cams have flat surfaces. When the flat surfaces are facing the accumulator shifting shoes, the accumulators will be out of mesh and remain out of mesh during flipper activities. If the rounded surfaces of the accumulator shifting cams are facing the shifting shoes, that accumulator's activities will be the same as the 410-11-011.



ACCUMULATOR CONTROL LEVER IN "A"



ACCUMULATOR CONTROL LEVER IN "B"

ACCUMULATOR CONTROL LEVER LOCKS

There are two locks for the accumulator control lever. One lock is operated from an aperture in the main control operating slide. This, through a cross shaft, operates the offset of the lock lever into the path of a stud on the right side of the accumulator control lever. This lock prevents the main operating slide from moving forward, if any of the operating keys are depressed while the accumulator control lever is between the "A" and "B" positions.

The other lock is operated from the #4 main cam. Its function is to lock the accumulator control lever during machine cycles. As the #4 main cam starts its forward stroke the offset of this lock follows through spring tension, and moves into position to block a stud on the left side of the accumulator control lever before the two rollers of the rack arm restoring latch assembly have left the dwells of camming surfaces "X".

TRANSFER TOTAL FUNCTION

To accomplish a transfer total, an additional control operating slide has been added to this model, namely, the transfer total control operating slide. This slide is located between the quick stroke control operating slide and the index blades' shifting control operating slide.

The function of this slide is to operate the transfer total latches into engagement with the transfer total studs at the beginning of the forward stroke just before the total trips. As far as the "A" accumulators is concerned, the function is the same as during a regular total operation on 410-11-011. The "B" accumulators are out of mesh during the forward stroke due to the accumulator control lever being in "A" position.

At the beginning of the return stroke, when the minus flipper action takes place, the "A" accumulators will be shifted out of mesh and during this movement the transfer studs pick up the transfer total latches. The transfer total latches are connected to the transfer shifting shoes. These shoes engage the circular portion of the transfer shifting cams on the "B" accumulator shaft and move the "B" accumulator into mesh with the rack arm teeth. Consequently, the amount cleared out of "A" accumulator will be added into "B" accumulator during the return stroke. Near the completion of the return stroke, when the transfer total control operating slide is restored, the transfer total latches will be restored, out of the path of the transfer total studs.

The transfer control operating slide also controls the "B" and "T" symbol.

When the accumulator control lever is positioned in "B" a linkage connected to the accumulator control lever operates a crank shaft which, through a clamped arm, moves the total control operating slide rearward. This allows "B" and "T" symbol operating shaft and arm, through spring tension, to raise the "B" and "T" symbol bar to "B" printing position.

With the transfer lever in "T" (transfer) position and the total key depressed, cycle the machine in its forward stroke. As the transfer control operating slide moves forward it picks up the offset arm on the "B" and "T" symbol operating shaft thereby permitting the symbol operating arm to raise the "B" and "T" symbol bar to "T" position.

NEGATIVE TOTAL TRANSFER FUNCTION

With a negative amount in "A" accumulator and the transfer total lever in "T" position the negative total is accomplished in the same manner as on a 410-11-011.

Since the total key is locked down during the three machine cycles and released during the return stroke of the 3rd cycle, the total transfer control operating slide is permitted to function on all three machine cycles. Therefore, the amount cleared from "A" accumulator during the first forward stroke will be added into "B" accumulator during the first return stroke. The amount subtracted during the 2nd forward stroke will be added into "B" accumulators during the 2nd return stroke. Finally, the amount cleared out of "A" accumulator (and printed) during the 3rd forward stroke will be added into "B" accumulators during the 3rd return stroke.

Sample Problem: With "A" and "B" accumulators cleared to zero subtract $2.25 from "A" accumulator. Upon depression of the total key the machine will perform a regular negative total function as far as the "A" accumulator is concerned.

In "B" accumulator before the total key was depressed	000000000	
In "B" accumulator	999999775	end of 1st cycle
In "B" accumulator	999999775+	
	999999550	end of 2nd cycle
	225+	
In "B" accumulator	999999775	end of 3rd cycle

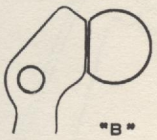
When the sub-total key is depressed the transfer mechanism will not function; because the sub-total blocking bail prevents the forward movement of the transfer control operating slide.

It will be noted that at the completion of a negative total operation the negative total cam shaft has rotated one complete revolution although the machine performed only three cycles. This is accomplished by adding a one tooth ratchet to the negative total cam shaft. A feed pawl, driven by a linkage connected to #1 main cam operates the ratchet. The one tooth ratchet will be moved to its operative position during the return stroke of the 2nd cycle. During the forward stroke of the 3rd cycle the feed pawl engages the one tooth ratchet and advances the negative total cam shaft 1/4 revolution. Therefore, during the return stroke of the third cycle, when the negative total cam shaft is again advanced 1/4 revolution, the negative total cam shaft will have completed one full rotation and be again restored.

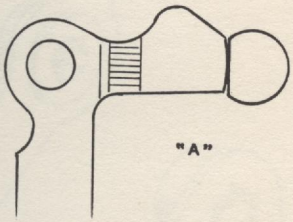
During negative sub-totals the negative total cam shaft is shifted to the left. This positions the one tooth ratchet out of the path of the feed pawl and permits the negative total cam shaft to rotate 1/4 revolution during each return stroke only.

ACCUMULATOR SHIFTING CAMS, ADJUSTING SEQUENCE

Machine in neutral:



1. With the accumulator control lever in "A" position, time the lower pinion with the selector fan teeth to permit the flat surface of the "B" accumulator shift cams to face the "B" shifting shoes, parallel.



2. With the accumulator control lever in "B" position, time the upper pinion with the selector fan teeth to permit the flat surface of the "A" shift cams to face the "A" shifting shoes, parallel.

NOTE: If the timing requires less than a one tooth change, the square coupling shafts may be slightly twisted to bring the flat of the cam into parallel with the shifting shoe.

ACCUMULATOR ADJUSTING SEQUENCE

The result of the accumulator adjustments are the same as 410-11-011.

1. With the accumulator control lever in "B" position, cycle the machine halfway through a minus forward stroke. Loosen the two set screws of the left hand accumulator shifting shoe assembly and the mercedes clamp of the flipper control arm. With the flipper control arm flange held up against the roller on #1 main cam and the right hand accumulator shifting shoe assembly held down against the cross shaft, tighten the mercedes clamp for the flipper control arm, and in the same position hold the left hand shifting shoe assembly down against the same cross shaft. Then tighten the two set screws.

   In this same position adjust the right and left accumulator shifting shoes against the "B" accumulator shifting cams to permit the "B" accumulator gears to rotate with slight clearance from the detent prongs.

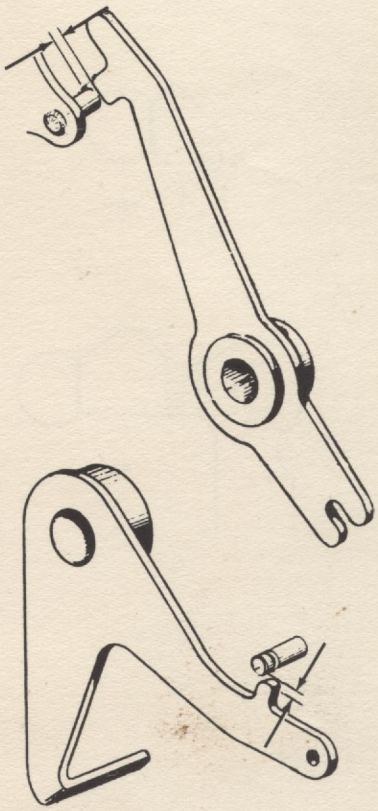
2. With the machine in neutral and the accumulator control lever in "A" position; adjust the hexagon eccentrics for the "A" accumulator shifting shoes to permit the "A" accumulator gears to rotate with slight clearance from the detent prongs.

3. Check the flipper control shaft's toggle spring arm for proper toggle action.

NOTE: The toggle spring arm and the two set screws also control the end play of the flipper control shaft to permit free movement of the transfer shifting shoes.

ACCUMULATOR CONTROL LEVER LOCK ADJUSTMENTS

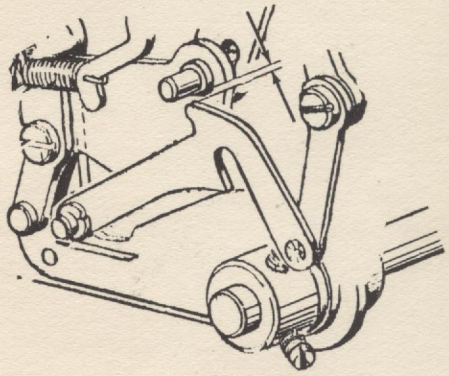
1. Machine in neutral: Adjust the inside lock by the adjustable arm on the cross shaft to permit a slight clearance between the stud on the control lever and the lock lug when the accumulator control lever is halfway between the "A" and "B" positions.



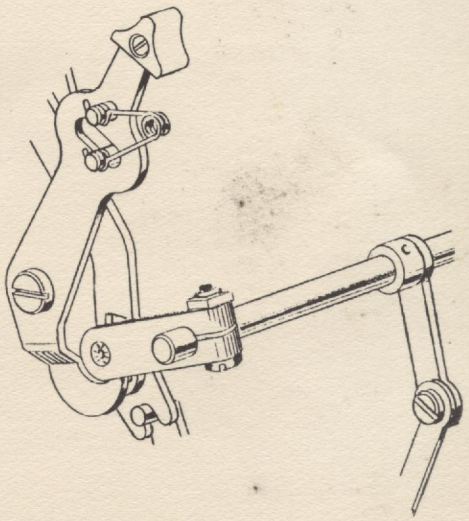
2. Machine in neutral: Adjust the tail of the outside lock, by forming, to permit a slight clearance between the spring stud on the accumulator control lever and the locking offset when the control lever is halfway between the "A" and "B" positions.

TRANSFER TOTAL MECHANISM ADJUSTING SEQUENCE

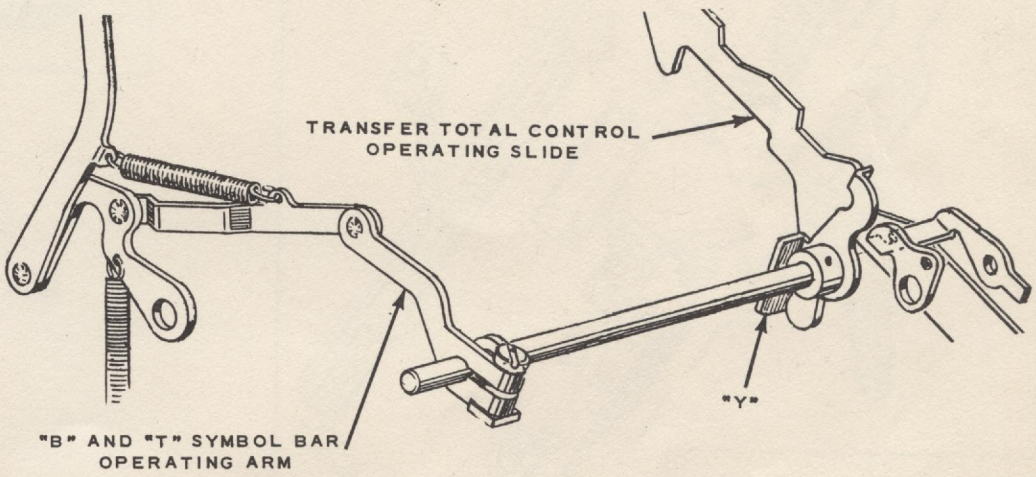
1. Cycle the machine full stroke forward in plus. Adjust the clamp on the transfer control slide arm to permit a slight passing clearance between the transfer total latches and the studs on the "B" accumulator shifting shoes assembly.



2. With the machine in neutral and the transfer total lever to the rear, (non-transfer position) adjust the clamp on the non-transfer arm to contact the hook on the lower end of the transfer total lever with no clearance.



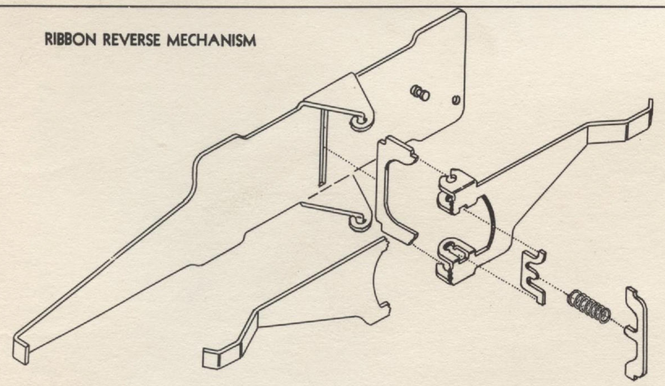
"B" & "T" SYMBOL ADJUSTING SEQUENCE



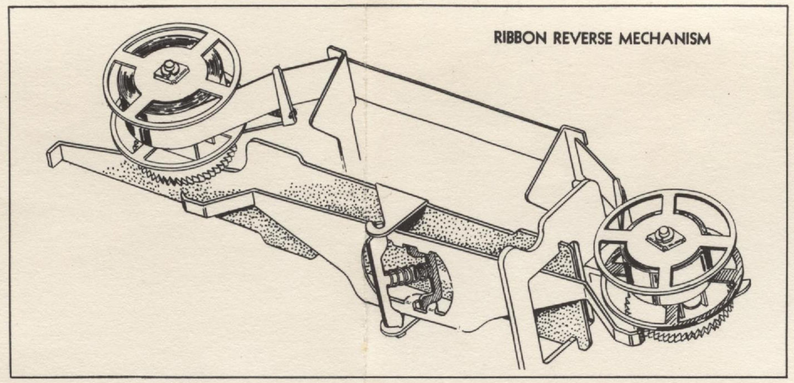
1. With the transfer total lever in "T" position depress the total key. Cycle the machine a full stroke forward. Adjust the clamp for the "B" and "T" symbol bar operating arm to permit the "T" symbol to print in horizontal alignment with the total symbol.

2. With the accumulator control lever in "B" position and a positive amount in "B" accumulator, depress the total key. Cycle the machine a full stroke forward. Adjust the lower lug "Y" on the arm of the "B" and "T" symbols operating shaft, by forming, to permit the "B" symbol to print in horizontal alignment with the total symbol.

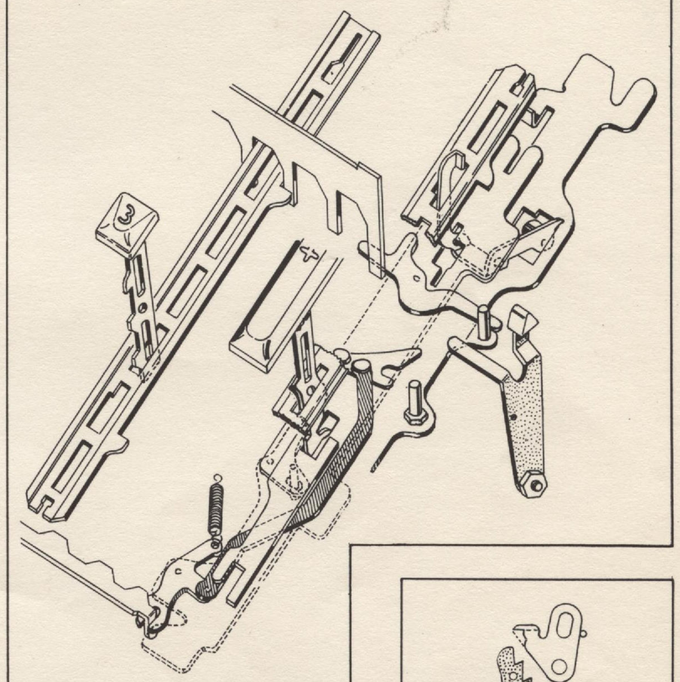
RIBBON REVERSE MECHANISM



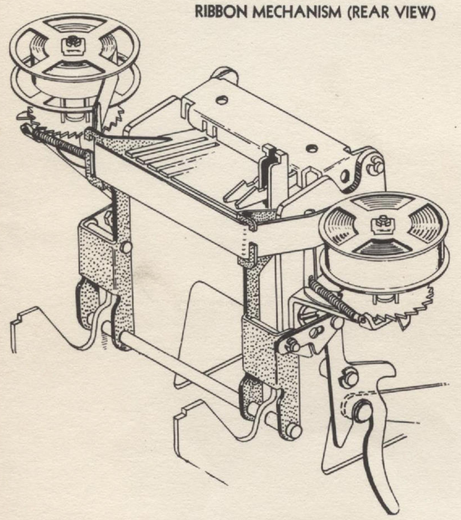
RIBBON REVERSE MECHANISM

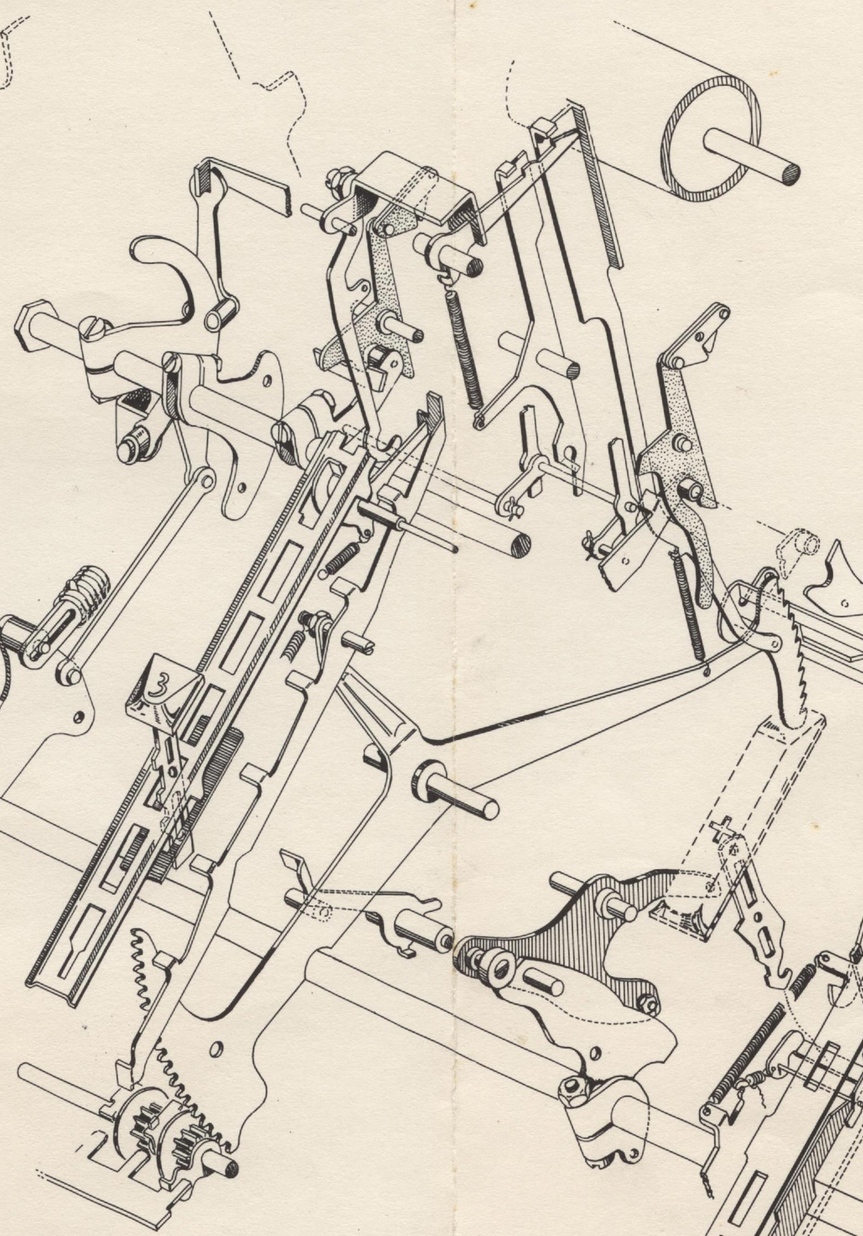


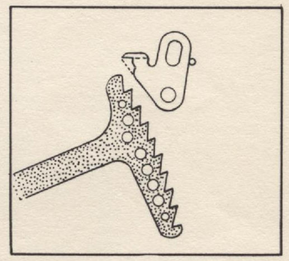
DETAIL OF CONTROL & NUMERAL KEYS LOCKS



RIBBON MECHANISM (REAR VIEW)

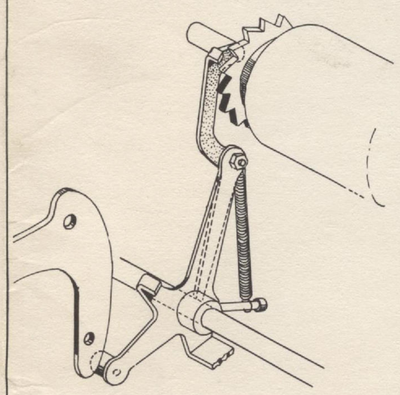






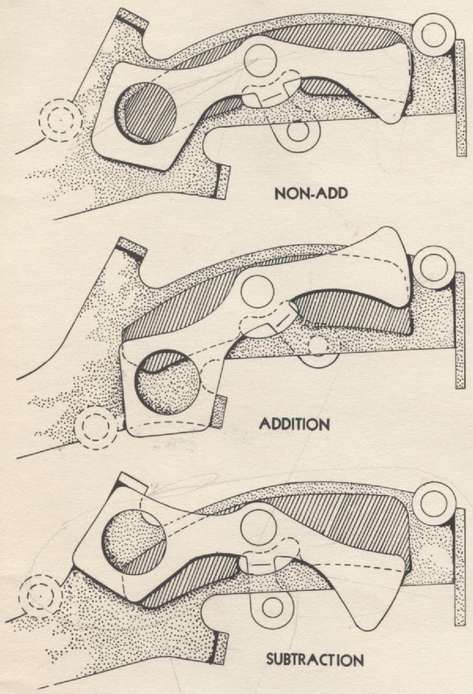
DETAIL OF RACK ARM ALIGNING BAIL

PLATEN SPACING MECHANISM

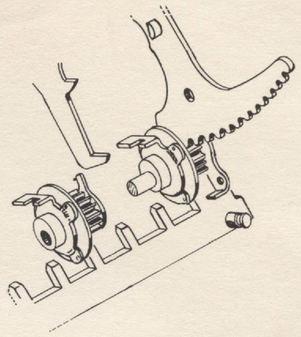


PRINTING MECHANISM

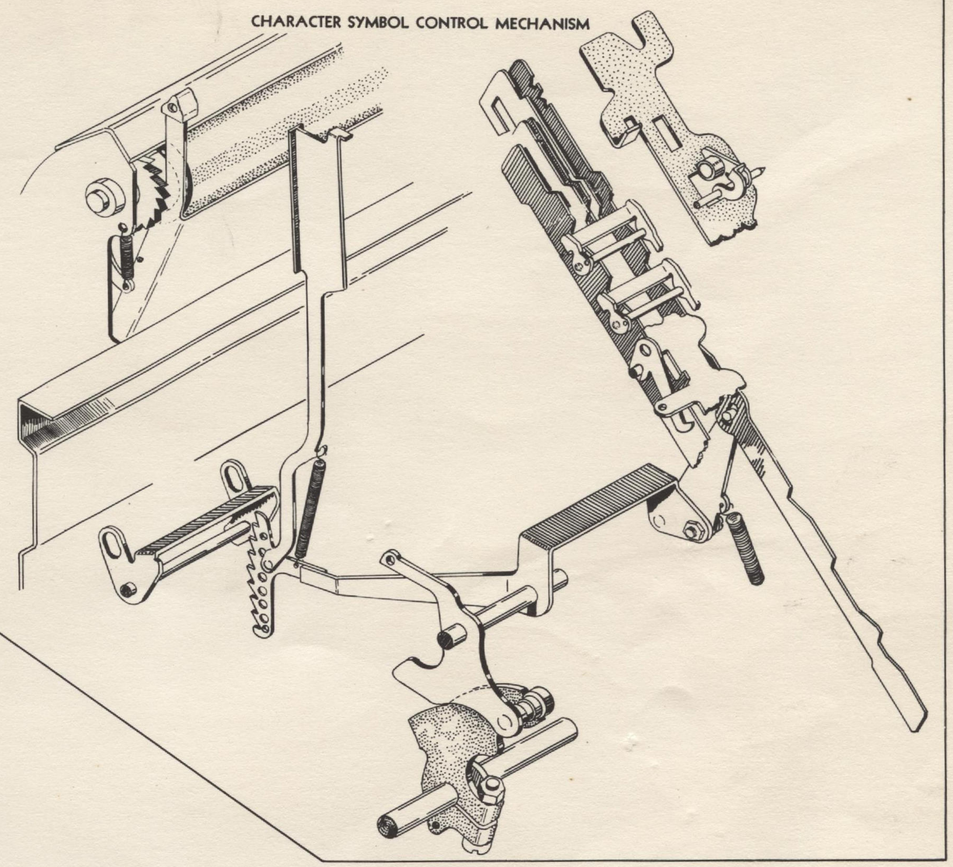
ACCUMULATOR CONTROL FLIPPER POSITIONS

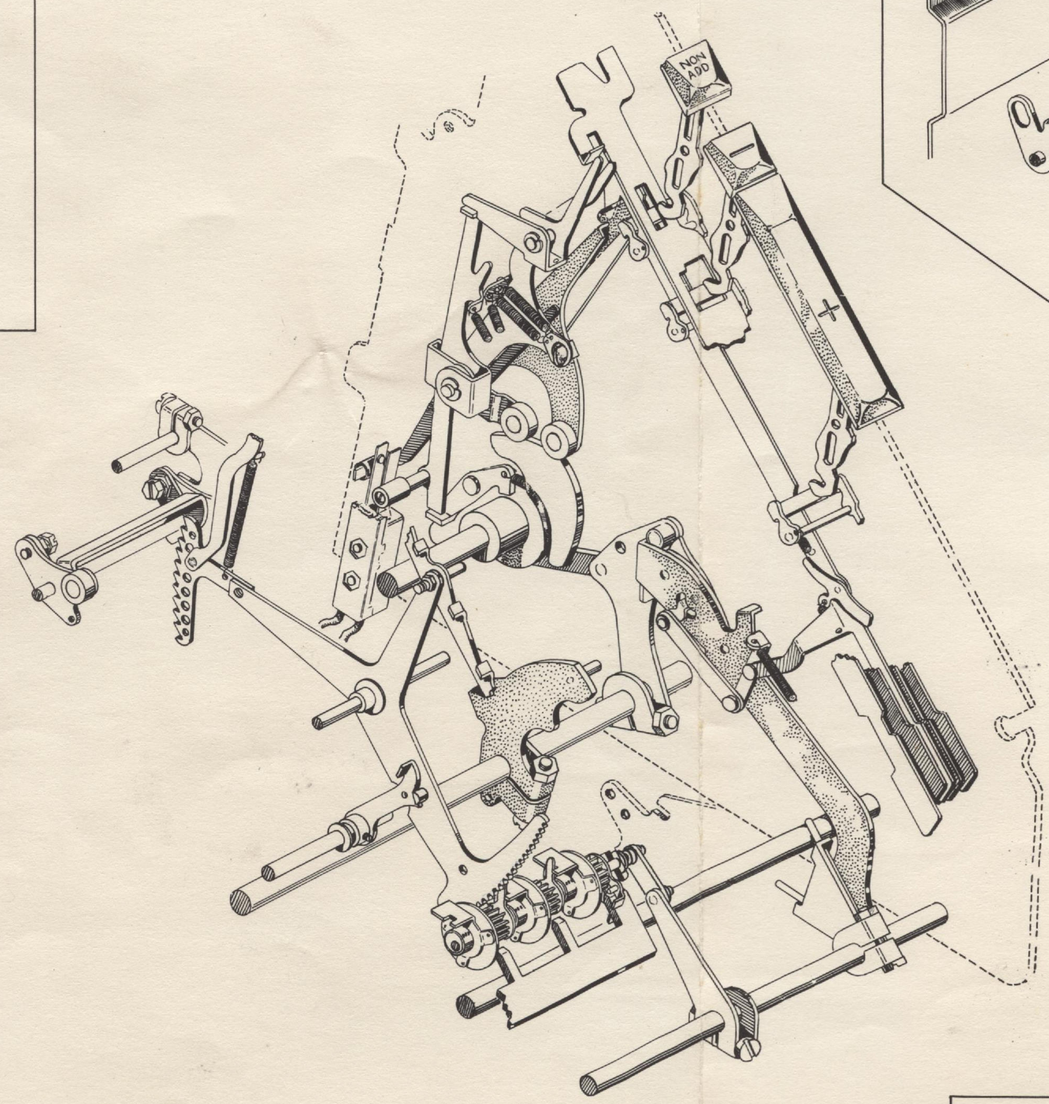


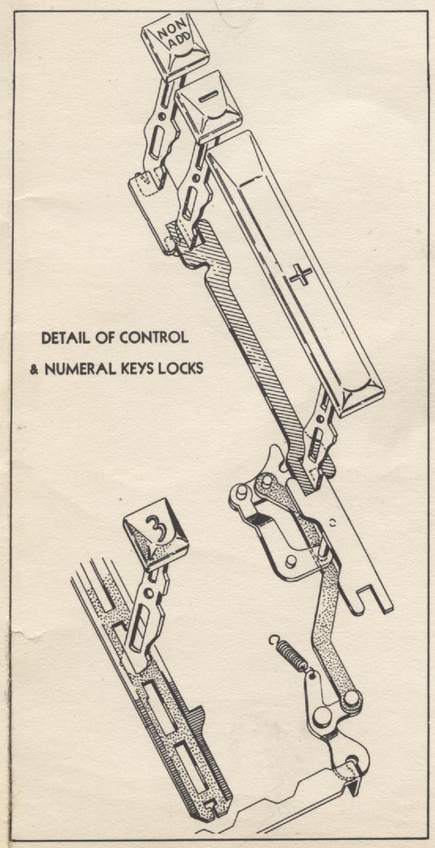
ACCUMULATOR MECHANISM



CHARACTER SYMBOL CONTROL MECHANISM

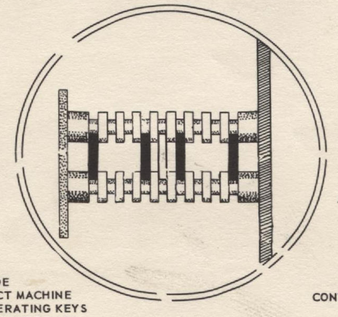






DETAIL OF CONTROL
& NUMERAL KEYS LOCKS

MACHINE OPERATING CONTROL SLIDES



NO. 1 SLIDE
CONTROLS PRINTING OF
ALL CHARACTER SYMBOLS

NO. 5 SLIDE
PRE.. TS INCORRECT MACHINE
OPERATIONS WHEN OPERATING KEYS
ARE ONLY PARTIALLY DEPRESSED

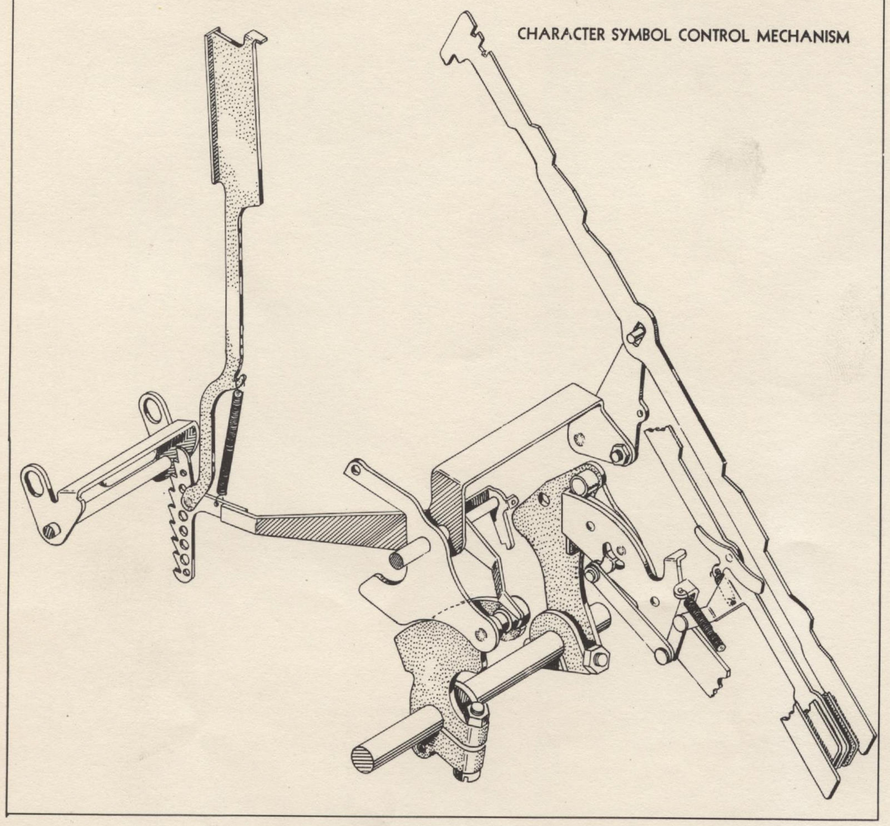
NO. 2 SLIDE
CONTROLS INITIAL RELEASE
OF TOTAL TRIP

NO. 3 SLIDE
CONTROLS REGISTER ACTION THRU
ACCUMULATOR CONTROL FLIPPER

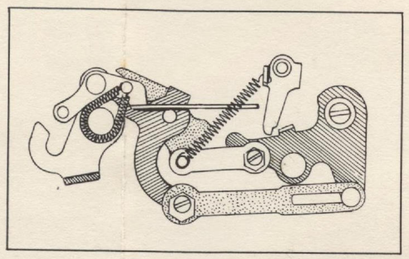
NO. 4 SLIDE
CONTROLS SHIFTING OF INDEX BLADES
IN TOTAL AND SUB-TOTAL OPERATIONS

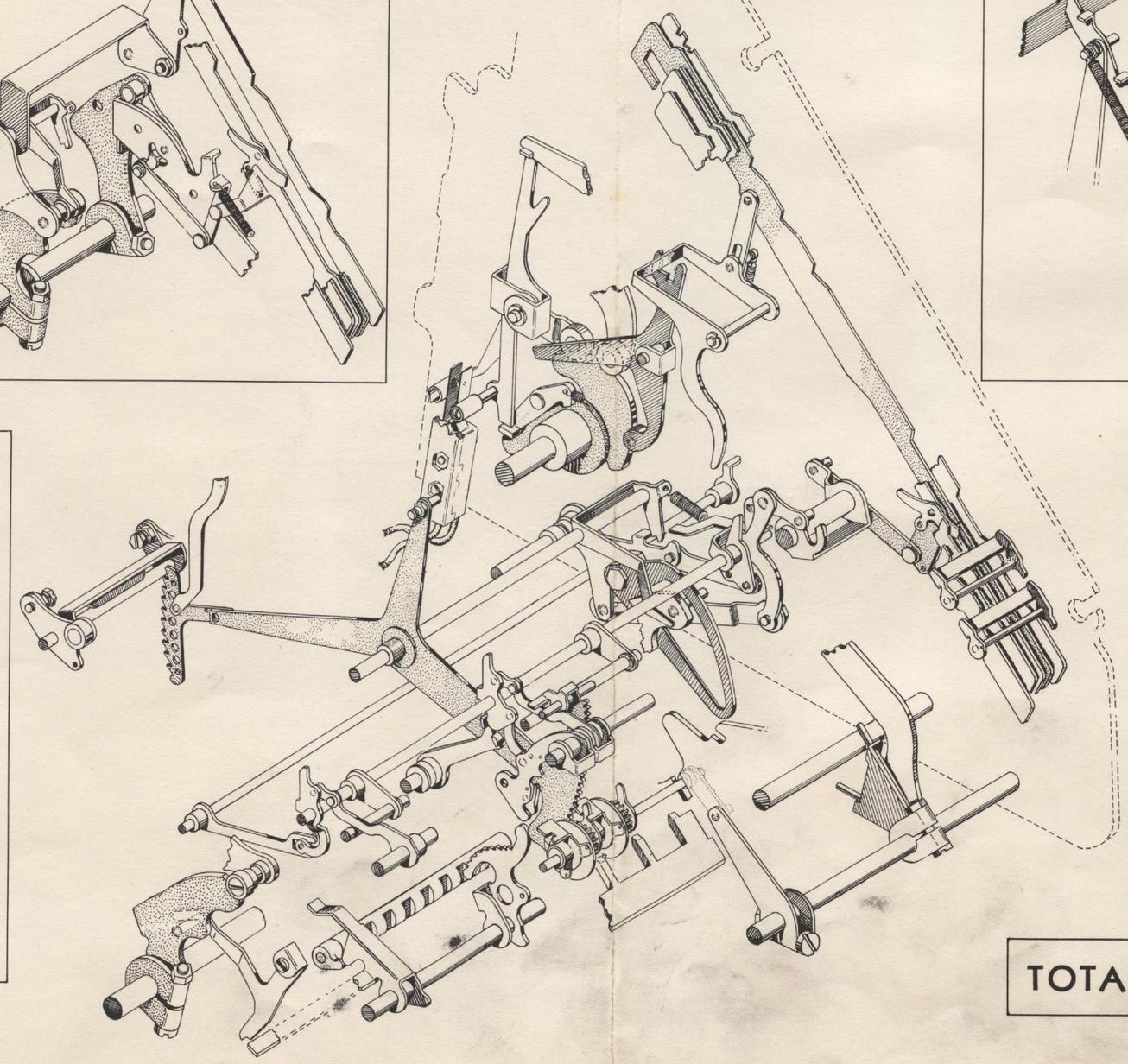
ADD, NON-ADD, SUBTRACT MECHANISM

CHARACTER SYMBOL CONTROL MECHANISM

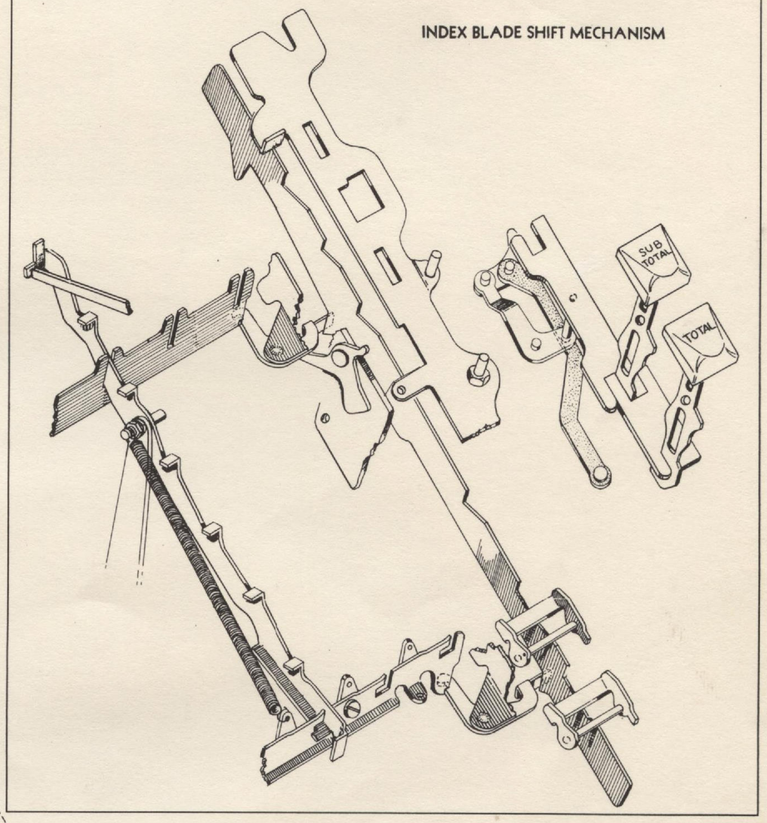


TOTAL TRIP MECHANISM

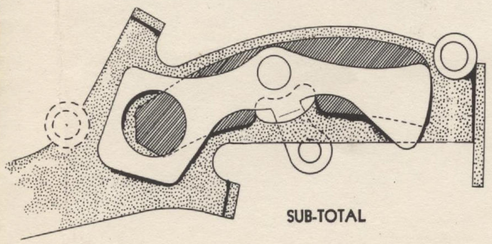




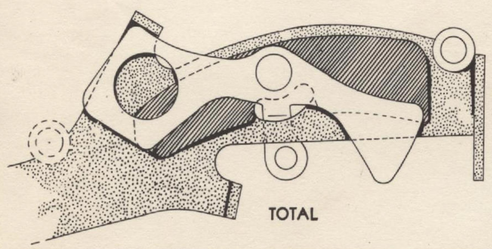
INDEX BLADE SHIFT MECHANISM



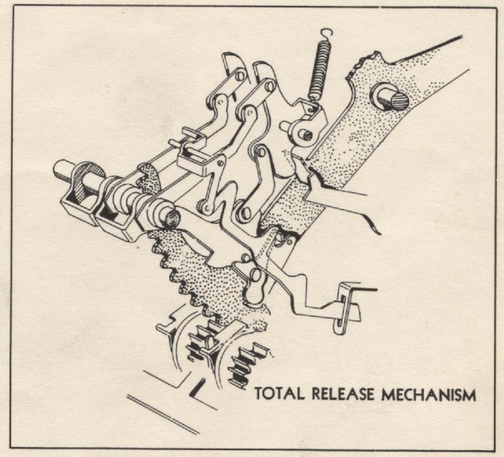
ACCUMULATOR CONTROL FLIPPER POSITIONS



SUB-TOTAL

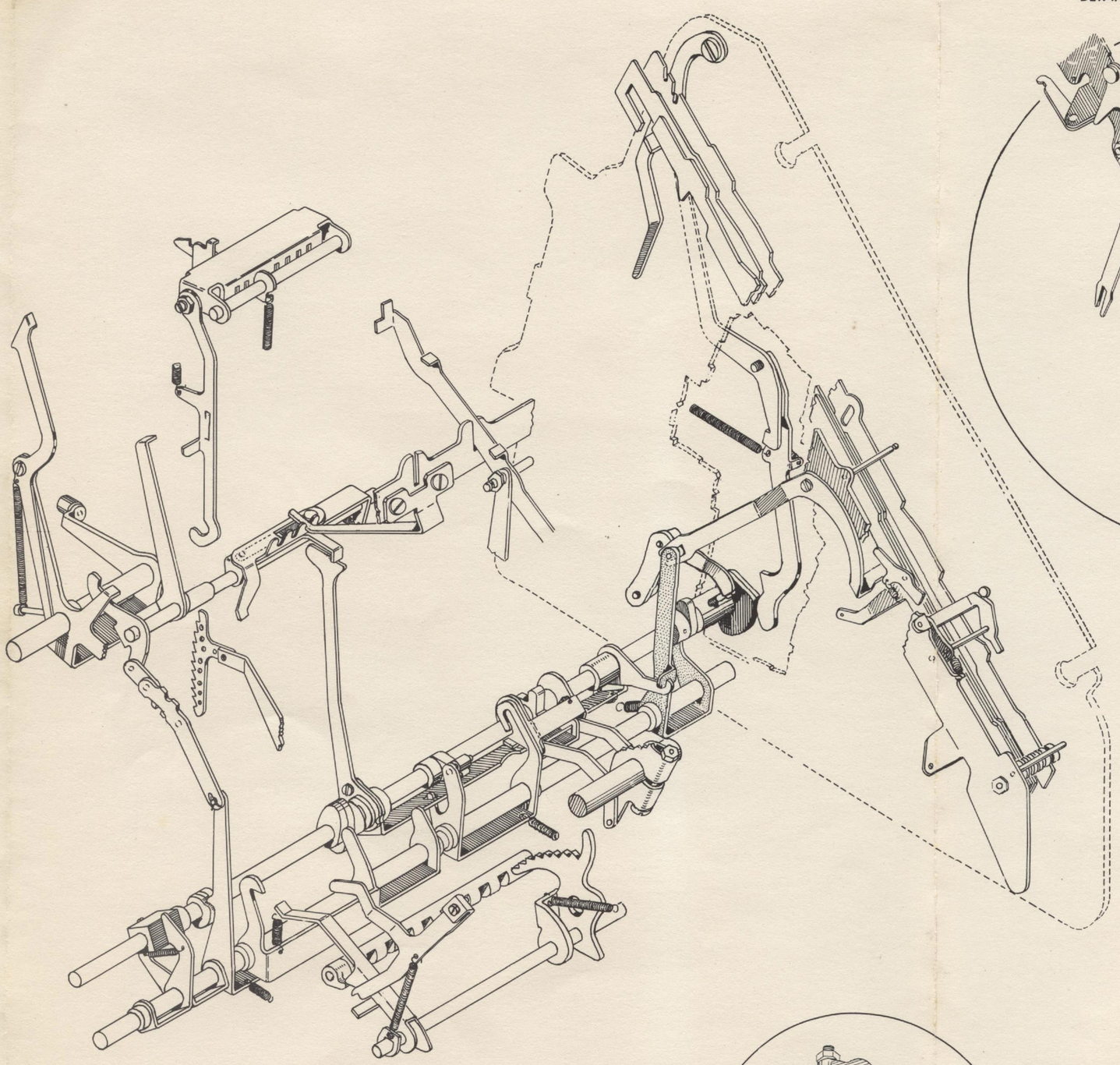


TOTAL

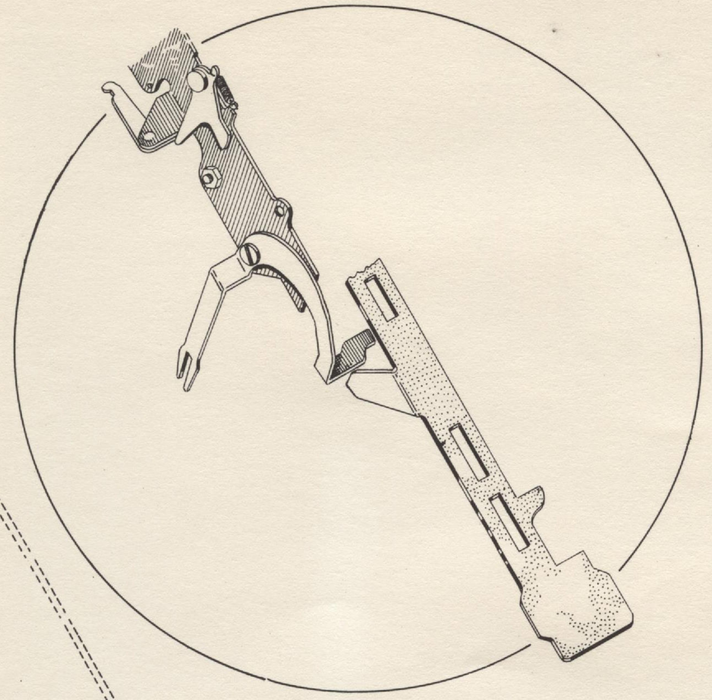


TOTAL RELEASE MECHANISM

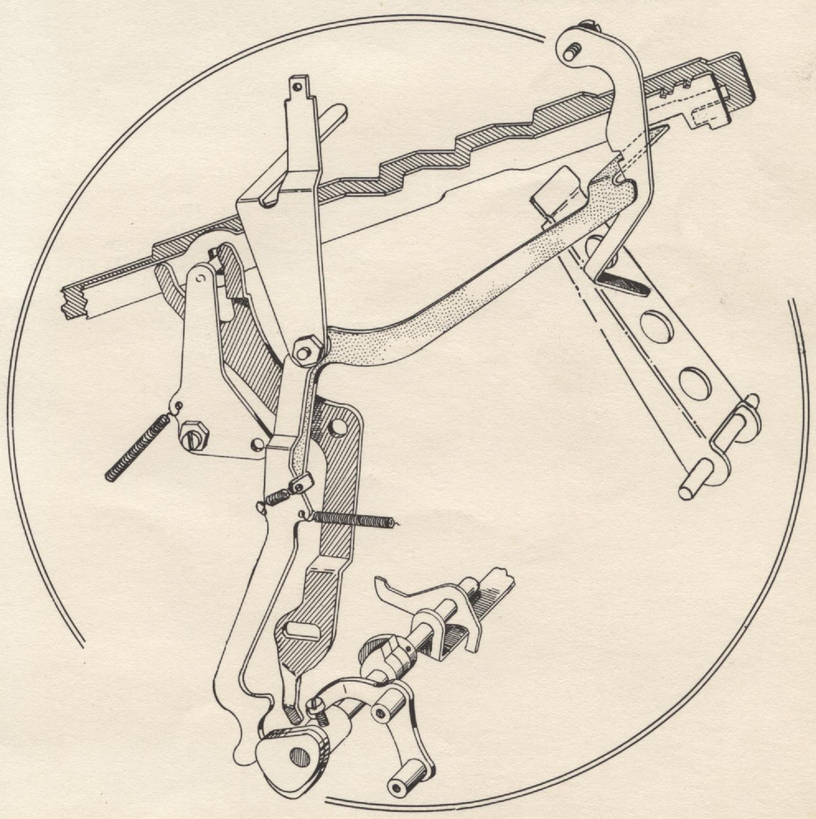
TOTAL, SUB-TOTAL MECHANISM

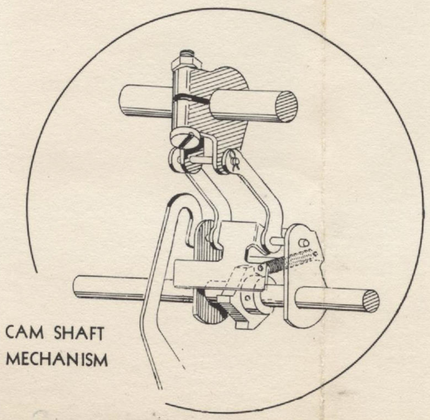


DETAIL OF OPERATING SLIDE BLOCKING ARM



CHARACTER & TOTAL TRIP SLIDE CONTROL MECHANISM





DETAIL OF CAM SHAFT
OPERATING MECHANISM

NEGATIVE TOTAL, SUB-TOTAL MECHANISM